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RESEARCH IN PROGRESS
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RESEARCH IN PROGRESS

July, 1925—July, 1926

This bulletin contains records of the investigations carried on at the University of North Carolina during the year ending July 1, 1926. The records of both faculty and graduate students are included. Publications of a general or popular nature and public addresses of the faculty are omitted. Abstracts of dissertations of candidates for higher degrees are included, both as a matter of record and for the information of other persons conducting research in the various fields represented by these essays. At the end of the book will be found programs of the various research organizations of the University, with tables of contents of the research journals published by the University.

The incomes from the Smith Research Fund and the Faculty Research Fund, administered by a committee of the Graduate Board of which Professor Harrer is Chairman, have been devoted to research work, much of which appears in abstract form in this Bulletin. Page 4 gives a tabular view of the grants made to the faculty, and six graduate students received aid from the funds also. A number of rare books and photostat copies of rare books have been purchased with the fund; part of it was used for defraying traveling expenses for study in other libraries.

During the year the Rockefeller Foundation made a grant of $5,000 for the promotion of scientific research. This has been expended by a committee of the science faculty under the direction of Professor W. C. Coker. A tabular statement of the grants appears on page 5. Part of the fund has been used to purchase scientific research apparatus and to pay research assistants.

The Laura Spelman Rockefeller Memorial Foundation grant for work in the social sciences, administered by a Board, of which the President of the University is Chairman, continued during the year. A statement of the work accomplished under this grant is found on pages 86-93.

In all a total of forty-eight projects are being aided by these funds in the various fields of research at the University. Both the social sciences and the pure sciences have special grants, and the Smith Research Fund and Faculty Research Fund are available to all three divisions of graduate study.

A. C. Howell, *Acting Dean.*

APPROPRIATIONS FROM THE SMITH RESEARCH FUND AND THE FACULTY RESEARCH FUND

PROJECT NUMBER	PROFESSOR	SUBJECT	AMOUNT
52	Learned	Purchase of special dictionaries for the study of Old French loan words taken into English	$172.36
53	Mangum	Research work in the Harvard Medical School	140.00
54	Royster	Philological research in Harvard Library and Library of Congress	70.00
55	Hickerson	Expenses for research work on highway curves	120.00
56	Kyser	Study of volatile oils from the cape jasmine in eastern North Carolina	100.00
57	Jones	Research work in New Orleans on the American reception of French culture from 1750 to 1848	75.00
58	R. E. Coker	Purchase of special books for the study of Copepods of North Carolina	90.00
59	Taylor	Purchase of two books for the study of Shakespeare and Florio	90.00
60	Pierson	Research work in Library of Congress	33.30
61	Holmes	Photostat copies of rare books for work on an edition of Du Bartas	112.44
62	Royster	Photostating copies of rare books in England	150.00
63	Swartz	Traveling expenses for the study of Chattanooga shale	100.00

Three prizes of $50.00 each for research of distinction by graduate students during the year were given from the Smith Fund. They were awarded as follows:

Languages and Literatures—Louis Booker Wright, for the study of vaudeville elements in Elizabethan drama.

Pure Sciences—Sihon Cicero Ogburn, Jr., for a study of the platinum metals.

History and Social Sciences—Divided between George Edgar Newby, Jr., for a comparison of the cotton manufacturing industry in New England and the South, and Francis Sidney Wilder, for a survey of the types of crime in North Carolina.

APPROPRIATIONS FROM THE ROCKEFELLER GRANT FOR SCIENTIFIC RESEARCH

PROJECT NUMBER	APPLICANT	SUBJECT	AMOUNT
1	A. S. Wheeler	For research assistant and purchase of chemicals	$800.00
2	H. W. Crane	For assistance in organizing and analyzing data already collected	500.00
3	R. E. Coker	For assistance in collecting and studying micro-crustacea and other small fresh-water animals in North Carolina	700.00
4	C. S. Mangum	For the preparation and publication of plates illustrating his research on the embryology of the pig	350.00
5	D. A. MacPherson	For animals and apparatus to study "The Effect of non-specific Parenteral Injections on Antibody Production and Experimental Infection"	200.00
6	E. K. Plyler	For grinding and polishing crystals to study infra-red transmission spectra	100.00
7	W. deB. MacNider	To help pay salary of research assistant	200.00
8	W. F. Prouty	For field expenses and laboratory equipment in the study of North Carolina Triassic	200.00
9	Gerald MacCarthy	For a machine to be used in experiments on the plasticity of wax layers on mercury	98.00
10	C. E. Miller	For laboratory apparatus and for expert analyses of kaolin clays	129.50
11	Otto Stuhlman	For electrical apparatus to be used for the study of ionization potential of tungsten in some allied metals	393.00
12	J. N. Couch	For travelling expenses and equipment for collecting in the tropics during the coming summer	500.00
13	W. C. Coker	For assistance in the study of North Carolina fungi and for the expenses of several collecting trips by an assistant to the coast of North Carolina	675.00
14	Archibald Henderson	For travelling and other expenses connected with the preparation of a work on the Einstein Theory	150.00

DEPARTMENT OF ANATOMY

W. C. GEORGE has completed the following studies:

The Histology of the Blood of Perophora Viridis. *Journal of Morphology and Physiology,* 41, 2: 311-331, March, 1926. For abstract see *Anatomical Record,* vol. 29, March, 1925, p. 357; or *Research in Progress,* 1924, p. 5.

The Structure of Some Young Dog Embryos. Presented before the North Carolina Academy of Science at Wake Forest, N. C., April 30, 1926.

DEPARTMENT OF BOTANY

W. C. COKER has published during the year the following:

Further Notes on Hydnums. *Journal of the Elisha Mitchell Scientific Society,* 41: 270. 1926

This is an article of 18 pages, giving critical notes on 15 species, divided among 6 genera. There are 13 photographic plates and 2 line plates of microscopic detail. One genus, *Hydnodon,* is reported for the first time from the North American continent.

Since the publication of the paper on water molds in the soil, reported in *Research in Progress,* 1925, p. 5, several graduate students have carried on work on similar lines, and several new and otherwise interesting forms have been discovered. These results will be published in the near future in collaboration with Dr. Coker.

DEPARTMENT OF CHEMISTRY

JAMES M. BELL has begun an investigation in which two of the remaining missing elements have been looked for. These two missing elements, from our knowledge of the Periodic arrangement of the elements, will be in the family with manganese, and will bear close resemblance to manganese. Consequently a manganese ore is being carefully and completely investigated as the most promising source of the elements.

JAMES M. BELL has directed the following studies:

HORACE D. CROCKFORD continues his investigation of the latent heat of fusion of certain of the nitrotoluenes. (Ph.D. Thesis, June, 1926.)

The latent heat of fusion of a substance is usually derived indirectly by the application of van't Hoff's formula connecting latent heat with freezing point data. The purpose of this investigation is to check by direct experiment the values thus obtained for certain of the nitrotoluenes.

The method first tried was to measure the heat change produced by the introduction of a bulb of the weighed material in the molten condition and at a known temperature into a calorimeter, the calorimeter being at such a temperature at the time of introduction that the final temperature of the system was below that of the melting point of the compound under investigation. This method made it necessary to know the specific heat of both the liquid and solid material and to know the correction necessary for the bulb. It was found that the heat changes produced by the nitrotoluenes were of such a magnitude that it was impossible to determine these quantities accurately.

The next method tried was that used by Stratton and Partington in their investigation of the heat of fusion of sulphur and nitrobenzene. In this method a container of the solid material fitted with a thermometer and heating unit is placed in a bath consisting of the material under investigation in both the liquid and solid forms. Hence the equilibrium temperature of the bath and container will be that of the melting point of the compound. When this equilibrium is obtained heat is supplied to the container by means of the heating unit. The first rise of temperature indicates that complete fusion has taken place and that the energy input is equal to the heat of fusion of the sample used. It was found that this method could not be applied to the nitrotoluenes as the heat distribution in these substances is so slow that a rise in temperature is obtained long before complete fusion has taken place.

A method making use of the heat of solution has been found to give excellent results. An adiabatic calorimeter has been constructed consisting of a Paar calorimeter bomb containing an air-jacketed inner vessel, the bomb being immersed in a vessel of water the temperature of which can be regulated to one-hundredth of a degree by means of a lamp and rheostat. Tubes for the thermometer, stirrer, leads to the heating unit, and breaking apparatus are fitted in the lid of the bomb. A bulb of the material is placed in the breaking apparatus; and when the system has reached equilibrium the bulb is broken, the cooling effect produced in the solvent being compensated for by means of the heating unit. At the same time the temperature of the bath is kept at that of the solvent so as to prevent heat exchange between the bomb and bath. The energy necessary to reestablish the original equilibrium temperature is the heat of solution. It was found that xylene was an excellent solvent on account of its relatively high boiling point, and the fact that the heat of solution of the nitrotoluenes in this solvent is negative and of considerable magnitude. The difference between the heat of mixing of the two liquids just above the melting point of the compound and the heat of solution just below the melting point is the heat of fusion. The chief advantages of this method are: it is not necessary to know the specific heat of either the liquid

or solid nitrotoluene, no correction is necessary for the bulb, and the temperature change is so slight that the resistance of the heating unit can be considered constant throughout the experiment.

The values obtained by the application of van't Hoff's equation show a very wide range of variation, the most probable values being: para-nitrotoluene, 30 calories per gram; 2-4-dinitrotoluene, 23 calories; 2-4-6-trinitrotoluene, 18 calories. Direct determination gives values approximately half of these. Heat of fusion and heat of solution of the liquid decreases with increase in the number of nitro groups in the molecule. The values obtained calorimetrically are as follows: para-nitrotoluene, 15.2 calories per gram; 2-4-dinitrotoluene, 13.72 calories; and 2-4-6-trinitrotoluene, 10.70 calories.

Sihon Cicero Ogburn, Jr., has continued his investigation of the platinum metals begun at Washington and Lee under the direction of Dr. J. L. Howe. (Ph.D. Thesis, June, 1926.)

From a systematic study of the analytical reactions of some thirty-three typical inorganic compounds on dilute solutions of the six platinum metals, it was found that:

(a) In general, the radicals most reactive are the sulphides; thiosulphates; hydroxides; halides; certain reducing agents as hydrazin, hydroxylamine, red phosphorus; and certain metals, as zinc and magnesium, more highly electropositive in their character than platinum.

(b) In these reactions the relative acidity or basicity of the solution plays a leading part, dilute acid solutions favoring their precipitation with sulphides, thiosulphates, halides, hydroxylamine and the metals, while with hydrazin an alkaline medium was found best.

(c) The salts formed in most cases are not simple salts in which the platinum metal functions as a cation. They are complex in their nature; most of them being insoluble double (additive) salts or co-ordinated (inner) salts. Most of the latter are extremely stable; the few which are soluble have a metallic complex which cannot be easily broken up. In these cases, such as the double nitrates or cyanides of ruthenium and platinum, this stability is so great that the metal cannot be gotten into simple ionic form for precipitation; sulphides and strong reducing agents act on them only slowly after prolonged standing—even the addition of zinc will not precipitate the metal.

From a similar study with nearly ninety organic compounds, it was found that:

(a) In general, the most reactive radicals are the thiocompounds; alkaloids; oximes; aromatic amines, non-substituted; nitroso hydroxy compounds; nitroso aromatic amines; pure hydroxy compounds; and amino hydroxy compounds.

(b) There is a marked difference in the apparent ease with which these metals are acted upon, the order of their reactivity being: palladium, platinum, rhodium, osmium, ruthenium, and iridium respectively.

(c) This order of reactivity has no obvious relationship to the order of their atomic weight or atomic number, but does tend to show a definite relationship between the number of electrons in the next to the last orbit (the orbit furnishing their 'secondary' valence) in each metal.

This led to the hypothesis: The nearer the platinum metal approaches its saturation value, in terms of electrons, in the next to its last electronic orbit, the more reactive is that metal toward the formation of co-ordinated salts.

Many typical color reactions were found which are useful in qualitatively detecting these metals in a pure solution of themselves. Among the new reactions suggested are:

(a) For ruthenium: 1. A deep violet solution obtained by boiling with phloroglucinol. (After the ruthenium solution has been made alkaline with potassium nitrite. 2. A blue solution—on warming with allyl thiourea. 3. A deep violet solution—on warming with p-nitroso phenol.

(b) For osmium: 1. (K_2OsO_4)—a deep rose solution—on warming with aniline sulphate—or, with (K_2OsCl_6), a violet solution. 2. A deep blue solution with b-napthalamine HCl, pyrocatechin, or pyrogallic acid.

(c) For iridium: 1. A deep blue solution—on warming with aniline sulphate.

Tables were made giving in detail:

(a) The principal analytical reactions of the platinum metals with both organic and inorganic reagents.

(b) A summary of the reacting power of these reagents on each of the metals.

(c) The relationship of the chemical constitution of the reagent to its precipitation power.

(d) An extensive list of reagents which may be used in identifying and separating these metals.

In conclusion, a new gravimetric scheme of analysis of the platinum metals is given. It is short and comparatively easy, for those unfamiliar with the detailed chemistry of the metals, to carry out. The metals are removed by successive precipitations, as follows:

Starting with a mixture of the six metals in solution as chlorides (or double chlorides) containing an HCl content equivalent to 7 or 8 cc. of conc. HCl per 100 cc. of solution, the palladium is removed by a 1% alcoholic solution of dimethylglyoxime in the cold. From the filtrate, the platinum is removed by precipitation with a-furil dioxime in a boiling alcoholic solution. After concentrating the filtrate by evaporation and adding hydrochloric acid and sodium chlorate to remove excess of the oximes, the rhodium is precipitated with alcoholic potassium nitrite solution on boiling and cooling overnight. The residue is dissolved in boiling aqua regia, evaporated with concentrated hydrochloric acid diluted and the metallic rhodium precipitated with magnesium turnings. The filtrate is made acid with concentrated hydrochloric acid, evaporated nearly to dryness, diluted, and the ruthenium precipitated

with alcoholic sodium hydroxide on boiling. The residue is dissolved in hydrochloric acid and the metallic ruthenium precipitated with zinc dust. The filtrate is then made distinctly acid with hydrochloric acid, after evaporating to remove alcohol, and the metals iridium and osmium precipitated in the finely divided state with metallic zinc. The two metals are then treated with a fresh solution of sodium hypochlorite; this dissolves the osmium and leaves the iridium unattacked. The latter is filtered. The osmium filtrate is made acid with hydrochloric acid and the metallic osmium is precipitated with zinc powder. Each of the metallic precipitates is subsequently dried, ignited in air (osmium to 190 degrees C. only), heated in hydrogen, cooled and the metals weighed.

This scheme offers an excellent gravimetric separation which is well adapted for approximate quantitative determinations (Within an accuracy of 2.5%). It is based upon well known principles; the only new analytical reagent used is the a-furil dioxime for the removal of platinum. The order of separation and the study of the conditions necessary to render the separation of value, was the most difficult part of the problem.

JACOB ADDLESTONE has investigated the electrometric determination of copper. The results are to be given in Mr. Addlestone's Master's Thesis.

The e. m. f. between electrodes placed in a copper solution was followed during the titration of copper by caustic soda. It was shown that a very pronounced jump occurs when 1 1-2 mols of NaOH are added to 1 mol of $CuSO_4$. This accords with the results obtained by G. M. Murphy by another method, and confirms the existence of a compound of formula $4CuO.SO_3.H_2O$. The best conditions for carrying out the titration have been sought by varying the temperature, the concentration of solutions, the metals of the electrodes, the speed of stirring during the titration, and the time between successive additions of the reagent.

KEBLE BARNUM PERINE. The Electrometric Titration of Copper and Zinc. (Master's Thesis, August, 1925.)

The problem of the thesis is the investigation of the quantitative determination of copper and zinc by an electrometric titration with a base. It was also desired to develop a method by which these two metals could be determined in the presence of one another. It is well known that when a base is added to a solution containing cupric ions, the copper is removed from solution as a relatively insoluble compound. The concentration of the cupric ions, upon the addition of a base, is at first lowered slowly; but towards the end point of the reaction the ion concentration is cut down very rapidly. The same sort of reaction takes place when a base is added to a solution containing a zinc salt. The end point of this type of reaction should be determined accurately by the electrometric indicator.

Copper sulfate was titrated electrometrically with sodium hydroxide using a 0.1 N calomal and a copper wire electrode. The standard base was run into a measured volume of a solution of copper sulfate of known concentration. During the titration the solution was agitated by an electric stirrer. It was found that approximately 75% of the equivalent quantity of base was required to reach the end point. An analysis of the precipitate showed that the copper reacted with NaOH to form the basic sulfate, $CuSO_4.3Cu(OH)_2$. It is believed that the following reaction takes place:

$$CuSO_4+6NaOH\rightarrow CuSO_4.3Cu(OH)_2+3Na_2SO_4.$$

The experimental error in the determination of copper by this method is approximately 1.5%.

Copper sulfate was also titrated with ammonium hydroxide and barium hydroxide using the same electrode system as before. The copper is precipitated as $CuSO_4.3Cu(OH)_2$. The end point of the curves of these titrations is not so well defined as the end point of the sodium hydroxide titration and the results are not as satisfactory. All of these titrations were carried out between 20°C and 25°C. A few degrees variation in temperature has no appreciable effect on the titration curve obtained. The titration curve at 95°C is not so steep as that obtained at the lower temperatures.

The most satisfactory electrode system was found to be the normal or 0.1 normal calomal and a copper wire electrode. A copper and a platinum electrode gave good results for the titration of $CuSO_4$ with NH_4OH. The combination of a calomal and a platinum electrode gave very unsatisfactory results.

The titration of zinc with either NaOH or NH_4OH gave unsatisfactory results because of the following secondary reaction:

$$Zn(OH)_2+2OH^-\rightarrow Zn\overline{\overline{O}}_2+2H_2O$$

Copper sulfate, in the presence of zinc, was titrated with sodium hydroxide. The presence of zinc in amounts up to 20% of the weight of the copper does not seriously affect the end point of the titration. When larger amounts of zinc are present, more than the calculated volume of base is required.

ALVIN S. WHEELER AND C. R. HARRIS. (First Section of Ph.D. Thesis, June, 1926.) Borneol in Spruce Turpentine. *Journal of the American Chemical Society,* 47; 2836, November, 1925.

In distilling spruce turpentine under a vacuum of 3 mm. the fraction coming over at 70-80° became a crystalline solid upon cooling, all other fractions remaining liquid. It formed large hexagonal plates on recrystalling from dilute alcohol. These melted at 206°. The product was proved to be borneol as follows: Its phenylurethane crystallized in needles, melting at 140-141°. Upon oxidation with nitric acid it gave camphor, the semicarbazone of which melted at 242°. A determination of its optical activity gave $[\alpha]_D^{20}$ -13.64. The pro-

duct is therefore 36% levo-borneol. It was proved to be free from iso-borneol for its optical activity remained constant in solutions of alcohol, ethyl acetate, and benzene.

ALVIN S. WHEELER AND C. R. HARRIS. (Second Section of Ph.D. Thesis, June, 1926.) 2-Amino-6-nitro-p-cymene and New Azo Dyes.

The work of the first year on this subject was reported in *Research in Progress,* for 1925, p. 8. The results this past year will be reported next year.

ALVIN S. WHEELER AND E. DEW. JENNINGS. (Progress on Ph.D. Thesis, June, 1926.) 2-6-Diamino-p-cymene and Certain New Azo Dyes.

The abstract will appear next year.

ALVIN S. WHEELER AND F. P. BROOKS. (Ph.D. Thesis, June, 1926.) 2-Amino-5-nitro-p-cymene and New Azo Dyes.

The object of this investigation was to prepare 2-Amino-5-nitro-p-cymene and to make from it certain derivatives.

The amino cymene used in this investigation was prepared by the reduction with tin and hydrochloric acid of 2-nitro-cymene prepared by the nitration of para-cymene which was obtained from North Carolina spruce turpentine.

In order to protect the amino group during nitration the compound was acetylated by boiling with glacial acetic acid for ten hours. As no satisfactory directions for purifying this compound were available, experiments were run to determine the best conditions; and it was found that it could be recrystallized by cooling to 0 degrees a 40% alcoholic solution which had been saturated at room temperature.

Owing to the difficulties encountered in the purification of the acet-cymidine before the above method had been worked out, a portion of the cymidine was benzoylated by treating with an alkaline solution of benzoyl chloride. This compound was recrystallized easily from hot 95% alcohol. It was nitrated by treating a portion dissolved in a large volume of concentrated sulfuric acid with the calculated amount of concentrated nitric acid, while the whole solution was kept at 0 degrees. The nitration product on recrystallization from alcohol gave a pale yellow crystalline body melting at 218 degrees. Analyzed for N this proved to be 2-benzoylamino-$\frac{?}{5}$-nitro-p-cymene. An attempt was made to obtain the free nitro amine by hydrolizing the benzoyl group. This, however, was unsuccessful as only a trace of the desired compound was ever obtained from this body.

The acetyl-aminocymene was then purified and nitrated by the method of Andrews. The product proved to be almost if not entirely composed of a pale yellow crystalline body melting at 148 degrees. Analysis proved this to be 2-amino-$\frac{?}{5}$-nitro-p-cymene.

This compound was hydrolized by boiling for ten hours with conc. HCl. Neutralization with NaOH and extraction with ether yielded on evaporation of the ether an impure nitro amine. This was steam-distilled. The distillate extracted with ether yielded on evaporation the 2-amino-5-nitro-p-cymene as a rich orange yellow oil. This oil decomposes on boiling at room pressure above 250 degrees. It does not crystallize at 0 degrees and appears to be fairly stable. It has a sweetish taste.

The hydrochloride was obtained by adding conc. HCl to some of the nitro-amine. It crystallized in clusters of white needles. It is not stable, undergoing hydrolysis when exposed to the air. It was analyzed for HCl and proved to be 2-amino-HCl-$\frac{2}{5}$-nitro-p-cymene.

Theoretical consideration of the processes involved in the nitration pointed toward the production of the compound containing the nitro group in the 5 position. That this could be proved by its conversion into 2-5-diacetyl-diamino-p-cymene was seen when a portion of the acetyl-amino-5-nitro-p-cymene was reduced and then acetylated. The product obtained had the same crystal form and melted at the same point as did the diacetyl derivative prepared by Kehrmann and Messinger from 2-5-dinitro-p-cymene. This compound was hydrolized and the dihydrochloride thus obtained showed the same properties described by the above authors for the dihydrochloride of their diacetyl compound.

A portion of the nitro amine was diazotized and coupled with phenol, resorcinol, beta napthol, Schaeffer's salt and Winther's salt. In each case the reaction seemed to run smoothly, yielding highly colored compounds. The beta napthol compound was purified in the form of long, well shaped, four-sided prisms of deep red color and a M. P. 248 degrees cor. Analysis showed it to be 1-(5-nitro carvacrylazo)-2-napthol.

The resulting compound obtained by salting out the dye made with Winther's salt proved to be the sodium salt of 2-(5-nitrocarvacrylazo)-1-napthol-4-sulfonic acid. It did not melt under 300 degrees and left an alkaline residue on burning. It was obtained from hot alcohol as a deep red powder soluble in water, alcohol, and ether.

The other dyes were made in such small amounts that it was impossible to purify them.

The following new compounds not previously described in this abstract were prepared and analyzed during the course of the work:

2-benzoylamino-5-amino-p-cymene.

2-benzoylamino-5-amino-p-cymene hydrochloride.

2-acetylamino-5-amino-p-cymene hydrochloride.

The following compounds were prepared; but on account of the scarcity of material and of time, they were not purified sufficiently to analyze:

2-acetamino-5-amino-p-cymene.

2-benzoyl amino-5-acetamino-p-cymene.

2-benzoylamino-5-benzoylamino-p-cymene.

1-(5-nitrocarvacrylazo)-2-napthol-6-sodium sulfonate.

2-4-(5-nitro carvacryl disazo)-phenol.

2-6-(5-nitro carvacryl azo)-resorcinol.

The results of this investigation substantiate the view that the effect of the $NH.COCH_3$ group upon the position to be occupied by the entering nitro group is much greater than that of the methyl and isopropyl group, since practically all of the compound obtained shows substitution para to the ortho group.

ALVIN S. WHEELER AND T. T. WALKER. (Master's Thesis, 1925.) 4-m-Nitrophenylsemicarbazide and Certain Derivatives. *Journal of the American Chemical Society,* 47, 2792, November, 1925.

See abstract in *Research in Progress* for 1925, p. 9.

ALVIN S. WHEELER AND W. H. LEMMOND. Iodo Derivatives of Para-Cymene. (Master's Thesis, June, 1926.)

The preparation of 2-iodo-p-cymene was carried out by diazotizing 2-amino-p-cymene and treating the diazo compound with a solution of potassium iodide, according to the equation:

$$CH_3C_3H_7C_6H_3N_2Cl+KI=C\ H_3C_3H_7C_6H_3I+KCl$$

The product was a yellowish oil with an aromatic odor. It decomposed on boiling at atmospheric pressure but distilled unchanged at 80° under a vacuum of 3 mm. This compound was first prepared by Edinger and Goldberg in 1900 by the action of sulfur iodide on p-cymene. This method has no indication of the location of the iodine atom. Our method definitely locates it in position 2, and thus establishes the constitution of the compound.

ALVIN S. WHEELER AND B. G. CARSON. (Progress on Ph.D. Thesis.) The Bromination of Napthazarine.

The first work in this investigation was reported in *Research in Progress* for 1925, p. 9. No work was done in the fall of 1925 or winter of 1926 but work is again under way. A new formula for napthazarine has been proposed in Germany, thus increasing the interest in this study. The subject is a complex one on account of the occurrence of isomeric forms.

ALVIN S. WHEELER AND LILLIE F. P. CUTLAR. (Progress on Ph.D. Thesis.) 2, 5-Diamino-p-cymene and New Azo Dyes.

This investigation has just been started, Spring Quarter, 1926.

FRANK C. VILBRANDT. An Oil-Bearing Shale of North Carolina. *Journal of the Elisha Mitchell Scientific Society,* XLI, Nos. 1 and 2, p. 115 (September, 1925.)

An introductory paper on the possible wealth in a North Carolina shale. Deductions made from analytical results obtained in a shale deposit of the Deep River Valley. The yields of oil, ammonia, and gas, together with an estimation of the value of this particular deposit are given.

Frank C. Vilbrandt. Recent Developments in the Chemical Industries of North Carolina. *Journal of the Elisha Mitchell Scientific Society,* XLI, Nos. 1 and 2, p. 108 (September, 1925.)

A statistical review of the progress made and some retrogressions occurring in the chemical industries of the state.

Frank C. Vilbrandt. Elimination of Surface Devitrification on Laboratory Quartzware. *Industrial and Engineering Chemistry,* XVII, No. 8, p. 835 (August, 1925.)

The causes of devitrification of fused and transparent laboratory quartzware under varying laboratory conditions revealed by microscopic and photomicro-graphical studies. The avoidance of the destruction of such apparatus was found to be accomplished by dissolving the initial "frosting" and surface devitrification with hydrofluoric acid, before the cracks and checks became too deep to prevent ready washing or flushing out of slagging substances.

Frank C. Vilbrandt. Study of Industrial Chemistry by the Unit Plant Research Development Method. *Journal of Chemical Education,* II, No. 9, p. 748 (September, 1925.)

A presentation of the plan, development topics and projects used in the plant research development method of teaching Industrial Chemistry in the Department of Chemistry, University of North Carolina, Chapel Hill, N. C.

Frank C. Vilbrandt. Oil-bearing Shales of North Carolina. *Industrial and Engineering Chemistry.* (To be published in June issue.)

A continuation of the study of the oil-bearing shales of the Deep River Valley, disclosing the presence of five new oil-bearing shale formations. Retort assays and analyses of the products obtained indicate the relative importance of this field as a source of supply of shale oil and ammonia fertilizer. Estimates made of these formations indicate about one billion tons of oil-bearing shales, which, according to data obtained in our laboratories, show a possible production of twenty-seven million gallons of shale oil and fifty thousand tons of ammonium sulfate. No evident insurmountable conditions present themselves in the mining of these shales.

Frank C. Vilbrandt and R. M. Byrd. Fire-Point Carbon Test. *Industrial and Engineering Chemistry,* XVIII: 699. (July, 1926.)

A presentation of the new lubricating oil test—the fire-point carbon test—for determining the extent of oxidation occurring in lubricating oils, and evaluating oils according to their asphaltogenic tendencies and carbon-forming properties.

FRANK C. VILBRANDT AND W. M. MEBANE. Cotton Classification with the Microscope. (Accepted for publication in *American Dyestuffs Reporter,* Master's Thesis, June, 1926.)

Samples of cotton were collected from selected fields at various conditions of age and ripeness. They were classified as green, medium-ripe, over-ripe, and after-frost samples. Fibers from these samples were examined under the microscope with crossed nicols and with the various lighting methods. A large number of drawings were made with the aid of the camera lucida. The weight ratios of cotton seed were determined for the various conditions of growth. The "rag doll" germination test was run on the seed from the samples. Commercial samples of cotton fabrics were examined for the different types of fibers and the extent to which they reacted toward dyeing and mercerization.

The samples were found to contain varying amounts of good, half-ripe, green, and dead fibers. The estimation of the relative number in each variety showed that those samples classified as medium-ripe contained a maximum of good fibers, and those classified as green and after-frost contained a maximum of imperfect ones. The rate of change of the seed-cotton ratio and the percentage of germination varied directly as the number of good fibers in the samples.

The fibers in the commercial samples were found to react toward dyes with a variance depending on the condition of the fibers and on the type of dye used. The degree of dyeing varied from a deep coloration to no color at all. The degree of mercerization was found to depend on the growth condition of the fibers.

It was concluded that the growth condition of the cotton fibers makes itself evident in affecting the general usefulness of the fibers, both as textiles and as raw materials; and that the growth condition of the fibers may be determined by microscopic examination, the seed cotton weight ratio, and by the percentage of germination of the seed.

F. C. VILBRANDT AND W. M. LOFTON, JR. Combustible and Non-Combustible Lubricating Oils. (Master's Thesis, June, 1926.)

The object of the research was to investigate the instability of lubricating oils under actual service conditions by comparing analytical data of unused oils with that of those used in a Ford motor mounted in the Industrial Chemical Laboratory. The tests were made on oils that had been run the equivalent of one hundred, two hundred fifty, and five hundred miles. The following oils were studied: Texaco light, medium, and heavy; Veedol light, medium, and heavy; Gulf light, medium, and heavy; Mobil oil A and Mobil oil B; castor oil; peanut oil and cottonseed oil.

The following physical constants were determined: Specific gravity, viscosity, demulsibility, emulsion, reaction to phenolphthalein and methyl orange, spot test, Conradson residue test, dilution test, fire-point residue test, and the cloud and pour point. In addition to these the carbon deposited on the piston

head and engine head was removed and analyzed for asphaltogenic and petrolenic substances, mineral matter, or road dust, and bearing metal and cylinder wall abrasions.

Although all the oils showed a great variety of differences in their manner of behavior, the conclusions reached were, in general, as follows:

The specific gravity and viscosity were lowered.

Flash and fire points decreased from those in new oils.

Demulsibility, or rate of settling out, lowered.

The emulsion formed rarely settled completely.

Reaction test showed change from neutral to acidic.

Unsaturation greatly increased.

Spot test showed a darker color.

Fire point residue test showed that the weight of the residue increases with length of trip.

Per cent carbon residue is proportional to the length of the trip in some cases, though sometimes lowered, and often variable.

The amount of carbon deposited in the motor shows a much greater increase in heavy than in light or medium grades, but in the latter case it is variable. Vegetable oils show a greater deposition of carbon than mineral oils.

F. C. Vilbrandt and Arlie Raymond Smith. Substitution of Sodium Compounds for Potassium Compounds. (Master's Thesis, June, 1926).

This investigation is one of a series of studies on substitution of sodium compounds for potassium undertaken as committee work upon the request of the National Research Council. The object of this study was to ascertain the possibility, as far as possible, of substituting sodium compounds for potassium compounds in Analytical Chemistry. A survey of Griffin's Technical Methods of Analysis was made and every determination and preparation calling for the use of potassium compounds selected for study. The procedure in each case was carried out according to directions given in the text, using sodium compounds and potassium compounds in order to get comparative results. The study shows that:

1. Sodium, barium, and calcium permanganates may be used interchangeably in place of potassium permanganate in approximately thirty-five preparations, standardizations and determinations.

2. Sodium iodide may be used in place of potassium iodide in approximately forty preparations, standardizations, and determinations.

3. Sodium hydroxide may be used in place of potassium hydroxide in approximately forty preparations, standardizations, and determinations.

4. Alcoholic sodium hydroxide may be substituted for alcoholic potassium hydroxide in approximately twenty determinations.

5. Sodium dichromate, sodium chromate, sodium aluminum sulfate, sodium cyanide, sodium sulfide, sodium sulfate, sodium nitrate, sodium fluor-

ide, sodium chlorate, and sodium ferrocyanide may be substituted for their corresponding potassium compounds in approximately fifty preparations, standardizations, and determinations.

It is concluded that sodium compounds may be substituted for potassium compounds in almost all technical determinations.

PROFESSOR VILBRANDT presented the following paper:

Utilization of North Carolina Coals. North Carolina Section of the American Chemical Society, Wake Forest, N. C. (May 1, 1926.)

Analytical studies on some low temperature distillation products of Deep River Valley coals show high volatile and smoke-producing coals rich in gas, motor spirits, and tars. With the by-production of these coals, the production of illuminating gas, motor spirits, coal tars, road tars, pitches, ammonium sulfate fertilizers, water gas coke, and manufactured low volatile domestic coal in economically important quantities will create an important industrial center in this valley.

PROFESSOR VILBRANDT directed the research and assisted in preparing the following papers read by his research students at Wake Forest, N. C., May 1, 1926, North Carolina Section of the American Chemical Society.

1. Cotton Classification. W. M. Mebane.
2. Lubricating Oils for Internal Combustion Engines. W. M. Lofton.
3. Reclamation of Crankcase Oils. J. G. Simmons.
4. Electro-plating of Aluminum. F. F. Jones.
5. Sodium for Potassium in Technical Analysis. A. R. Smith.

PROFESSOR VILBRANDT has the following investigation under way:

1. Evaluation tests on Internal Combustion Engine Oils. W. M. Lofton.
2. Reclamation Methods for Crankcase Oils. J. G. Simmons.
3. Service Tests on Vegetable Oil Lubricants. W. M. Lofton.
4. Deterioration of Lubricating Oils in Service. W. M. Lofton.
5. Phosphatic Shales of the Deep River Valley. W. M. Mebane.
6. Electroplating of Aluminum. F. F. Jones.
7. Unsaturation of Oils. K. H. Crutchfield.
8. Refining of Menhaden Oil. E. V. Kyser and Charles Braubach.
9. Comparative Emulsifications with the Carbonates of Sodium and Potassium. E. V. Kyser.
10. Lubricating Principle in Oils.
11. Elimination of Asphaltogenic Bodies in Lubricating Oils.

F. H. Edmister has carried on the following investigations:

Investigation of the Reaction of Sulphur at high Temperatures upon Carborundum and other Materials.

Since sulphur forms compounds with all metals and many non-metals, it is difficult to secure materials for containers for heating sulphur. The purpose of this investigation is to determine the suitability of carborundum vessels as containers for heating sulphur at high temperatures. The investigation will be extended to other materials in addition to carborundum.

Investigation of the Reaction of Sulphur at high Temperatures upon Carborundum and other Materials.

This reaction is used in several commercial processes but the chemistry of the reactions is obscure. An attempt is being made to determine the conditions under which a uniform product of constant composition can be made.

Formation and Reactions of Certain Thio-Carbonates.

The literature is incomplete in regard to these compounds. Of all the work which has been done, none is of recent date and in some cases the results are conflicting.

DEPARTMENT OF CIVIL ENGINEERING

G. M. Braune and H. F. Janda are directing a series of experiments to determine the intensity and distribution of earth pressures on culvert pipe. This work is being conducted jointly by the United States Bureau of Public Roads, the North Carolina State Highway Commission and the School of Engineering. Dr. William Cain is acting as consultant on the experiments, and H. Cantey, Jr., and H. M. Holmes, Jr., are in charge of the field work. (Joint Masters' Thesis of Messrs. Holmes and Cantey, June, 1926.)

Four two and one-half foot joints of thirty-inch cast iron pipe were placed on four steel columns, each column resting on the weighing table of a specially designed scale. The scales and columns were housed in a concrete culvert which extended across the roadway but underneath the fill. In the top of the concrete culvert there was a slot just large enough to admit the test sections of the pipe which were placed in a horizontal position with one-half of their surface protruding above the top of the housing culvert and exposed to the pressure of the earth fill, while the bottom half of their surfaces were inside the culvert and rested on the top of their respective columns.

Several fills of different materials (sand and clay) were constructed in one-foot layers above the culvert, and the earth pressures recorded. In addition to the measurement of the earth pressures, other tests have been carried out,

viz., deflection of pipe, effect of concentrated road loads at different heights of fill, vertical earth pressure during removal of fill, and effect of time and weather upon the pressure exerted on the pipe.

The data indicate that there is some value, k, the ratio of the exerted vertical earth pressure to the weight of the earth directly over the pipe, which, for all practical purposes, may be assumed to be constant for a given condition of construction. For the thirty-inch cast-iron pipe having a one-inch wall thickness and placed as described, k was found to be 1.00 for the clay fill, and 0.84 for the sand fill.

The experiments are now under way for determining the pressures on pipe of different degrees of flexibility and so placed that their entire surface will be exposed to the earth fill.

H. F. JANDA and DR. WILLIAM CAIN with H. CANTEY, JR., and H. M. HOLMES, JR., are conducting, in connection with the earth pressure study, certain laboratory experiments to determine the coefficients of friction and cohesion of various soils.

THORNDIKE SAVILLE AND R. S. DEARSTYNE have continued the first investigation of stream pollution to be made in North Carolina. The streams being investigated are Little and Moccasin creeks in Wake County, which receive the sewage from the town of Zebulon. Studies of Total Bacteria, Fecal and non-Fecal B. Coli, Protozoa, Bio-Chemical Oxygen Demand and Dissolved Oxygen are being made at a number of sampling stations. The investigation has been carried through two years, making semi-monthly analyses. The results will be published this year.

THORNDIKE SAVILLE has continued an investigation of silting in reservoirs and behind navigation dams as Chairman of a Committee on Silting of the American Society of Civil Engineers. The Committee is coöperating with the French Hydro-Technical Society in a world-wide study of the subject, and in this country is being assisted by the Corps of Engineers of the United States Army in studies of silting behind navigation dams on the Ohio River.

THORNDIKE SAVILLE, with RALPH M. TRIMBLE and CHARLES E. RAY, completed a Water Power Survey of New River in Ashe, Alleghany and Watauga Counties for the Department of Conservation and Development.

THORNDIKE SAVILLE, with RALPH M. TRIMBLE, is investigating the applicability of the fineness modulus and the surface modulus of sands as a criterion for specifying the size and grading in water filtration.

The present criteria, effective size and uniformity coefficient, are not satisfactory and the studies tend to favor surface modulus as a substitute. All constants so far proposed are based on the sieve analysis and future studies will involve the development of an entirely different method of analysis. A large number of analyses have been made of cores from an existing filter to determine the effect of the wash water in stratifying the bed and to determine the variations in surface layer.

THORNDIKE SAVILLE has published:

The Power Situation in North Carolina. *Manufacturers Record,* December 25, 1924, LXXXVI, No. 26, pp. 68-70.

The Cause and Correction of Red Water Troubles. *Bulletin of North Carolina Section, American Water Works Association,* 1925. Reprinted: *Engineering and Contracting,* February and March, 1926.

The Power Situation in North Carolina (with G. Wallace Smith), *Natural Resources,* North Carolina Department of Conservation and Development, December, 1925.

The Fineness Modulus for Filter Sands, with R. M. Trimble (discussion) *Journal of New England Water Works Association,* November, 1925.

T. F. HICKERSON has published through McGraw-Hill Book Company of New York: *Highway Curves and Earthwork.*

The aim of this handbook is to present briefly the allied problems of highway location, while laying the emphasis on the subject of curves and earthwork, including the widening and banking of pavements. The economic and aesthetic advantages of easement spirals are fully explained, and a large variety of original tables are presented to facilitate the layout of these curves, in order that their use may involve no mathematical difficulties for the field engineer.

A full theoretical treatment of curves illustrated with numerous examples is given for the benefit of the student, but the engineer in practice will find the tables and methods readily adaptable independently of the mathematical theory upon which they are based.

The text features:

1. A comprehensive treatment of both circular and spiral curves with external deflection angles extending to 140 degrees.

2. The unit curve of length equal to 100 feet as applied to both circular and spiral curves.

3. The location of various curves by deflections from the point of intersection of the initial and final tangents.

4. The use of the 100-foot unit curve in computing deflections and offsets to curves.

5. Vertical curves of steeper or flatter profile than the ordinary parabola.

6. The double-spiral curve and its advantages.

7. The unit spiral and circle for the cases when spiral angle equals $\frac{3\Delta}{10}$, $\frac{2\Delta}{10}$ and $\frac{10}{\Delta}$.

8. Spirals coinciding with a circular curve at the central point opposite vertex, and the simple relations existing.

9. The banking and widening of pavements around curves.

John Bee Padgett: The Design of a Two-Hinged Spandrel Braced Steel Arch, 200 Feet Span, 25 Feet Clear Rise at the Crown, 31 Feet Total Rise, and a 20-Foot Clear Roadway, for Heavy Highway Traffic. (Master's Thesis, June, 1926.)

Two-hinged arches are externally statically indeterminate in the first degree; the calculation of the reactions requires one more condition besides the equations of static equilibrium.

Any vertical load causes inclined reactions which may be resolved into vertical and horizontal components. From the conditions of equilibrium the vertical components are found as for a simple beam.

The two horizontal components at the hinges must be equal and opposite. They are determined by the condition that when the arch deflects there is no change in length between the hinges.

If the structure were free to move longitudinally, the arch truss could be treated as a single span. Any vertical loading, therefore, would cause a definite deflection of the free end. By equating this deflection to that caused by a horizontal force applied at the free end, an expression for the horizontal component of the reaction may be found.

In the formula thus derived, the areas of the members appear. Since these were unknown, an approximate solution was utilized, assuming that the areas of the chord members were each equal to unity, and that the effect of the web members was negligible.

Influence lines were drawn, stresses determined, and a more exact design of members made. This method was followed until the selected members and the computed stresses were satisfactory. It was found upon examination that the effect of neglecting the web members was negligible, the error being 2.59%.

Stresses due to temperature were determined and no increase in area was necessary, since specifications allow a 25% increase in stress without additional area.

DEPARTMENT OF CLASSICAL LANGUAGES AND LITERATURES

George Howe is engaged on studies of the Augustan Poets, especially Virgil, and is also directing graduate students' dissertations in Latin Literature.

G. A. Harrer has published:

The Latin Inscription from Antioch. *American Journal of Archaeology* XXIX (1925), pp. 429-433.

The paper criticises and supplements the first edition of an important inscription discovered at Antioch of Pisidia in 1924 and published in the *Transactions of the American Philological Association,* 55, (1924).

G. A. Harrer is working on a study, chiefly textual, of the *Res Gestae Divi Augusti.* He has practically completed work on a supplement to W. Liebenam's *Fasti Consulares,* and is continuing a translation and edition of Liudprand's *Relatio de Legatione Constantinopolitana,* a narrative of the tenth century. He is also directing graduate students' dissertations in the Latin field.

J. Minor Gwynn is making a study of the situation in Latin in the high schools of the state, and plans also to give a digest of the opinions on this subject of teachers of Latin and of school men.

The following Master's Thesis was accepted by the Department during the year:

M. H. Griffin: Roman Governors of the Province of Cappadocia.

Roman literature, especially historical, but particularly inscriptions, make it possible to get an intelligent idea of the Roman theory and practice of provincial government. This study is a contribution to that topic, giving in particular a chronological list of the governors of Cappadocia, one of the more important provinces in the Roman East.

The following studies have been undertaken by candidates for an advanced degree:

Kate deRosset Meares: The Gods of Italy in Virgil's Poetry.

Virgil was a scholar poet, a student of the past. Constant studied allusions to the mythology and history of the primitive times of Italy are to be found in his works. The oldest Italian *magni dei* are present: Jupiter, Juno and Minerva, the Etruscan triad, and other gods. The same appear also in their later Graecized guise, more Roman in conception, however, than Greek. But Virgil's purpose to glorify the age of Augustus would not let him linger in

the past. Summing up Rome as she stood before him, he looks forward to the Rome that is to be. His task of blending the old and the modern, the Italo-Roman and the Romano-Hellenic, was not to be achieved without some sacrifice of consistency. The two-fold view of certain deities made this inevitable. It is then all the more noteworthy that his *Aeneid* is thoroughly Roman and convincingly real.

JOHN W. HUFF: Mamertine's Birthday Panegyric Addressed to Maximian.

Along with Pliny's Panegyric delivered in honor of Trajan, there has come down to modern times a collection of orations in praise of several of the later emperors of Rome. This thesis gives a translation and edition of one of them, dealing with matters of language and history, the problems of date and authorship, and studies the possible influences from Cicero's oratory in style and vocabulary.

E. B. JENKINS is engaged on a study of the Minor Characters in the *Aeneid.*

LUCY E. AUSTIN is engaged on a translation and edition of a panegyric of one of the late emperors of Rome.

MARGUERITTE WERTZ is engaged on a study of the Role of Juno in the *Aeneid.*

MRS. M. A. HONEYCUTT is engaged on a translation and edition of a panegyric of the emperor Maximian.

DEPARTMENT OF ECONOMICS AND COMMERCE

D. D. CARROLL has studied, in collaboration with C. K. BROWN, North Carolina's early efforts to secure a trunk line railroad. It covers the history of the North Carolina Railroad, the Atlantic and North Carolina Railroad, the Western North Carolina Railroad, and the endeavors of the state government to weld these lines into a unified system.

(See also "Institute for Research in Social Science," page 89).

E. W. ZIMMERMAN read before the 13th Foreign Trade Convention, Charleston, S. C., April 29, 1926: The Economic Resources of the South Atlantic Area.

PROFESSOR ZIMMERMAN has in progress for early publication a study on the problem of commodity price control, with particular reference to rubber, coffee, nitrate, and potash.

W. J. Matherly has studied, in collaboration with Thomas W. Holland, negro business enterprise in the South. Research by the case method into the various types of negro enterprise as revealed by field investigations in the more important Southern cities.

(See also "Institute for Research in Social Science," page 91).

Prof. Matherly has in progress, in collaboration with Jennings J. Rhyne, a study of mill village population in North Carolina. An analysis of the economic, social, and religious status of these populations in groups, with especial emphasis on the forces of social disorganization. The case method is used.

(See also "Institute for Research in Social Science," page 90).

C. T. Murchison has studied the economic status of the southern textile industry. The factors accounting for the rapid growth of the industry, and an evaluation of the forces which appear most likely to determine the future development of cotton mills in the South.

Prof. Murchison has in progress, in collaboration with R. B. Eutsler, a field study of agricultural and residential credits available for Negroes in the South.

Dexter M. Keezer has completed: The Labor Problem of the United States Supreme Court. (Accepted for early publication in *Social Forces.*)

An Economic Analysis of the News, a treatment of the economic problems involved in the gathering and disseminating of news through the daily newspapers in the United States.

Professor Keezer has under way, in coöperation with Stacy May, of the Economics Department of Cornell University, a study of the Legal Control of Competition. (To be published at an early date.)

The following Masters' Theses were accepted by the Department during the year:

Addison Thayer Cutler: Rural Electrification.

In the rapid expansion of the electric light and power industry, the extension of service to the farmer has definitely lagged. At the same time, the farm offers abundant opportunities for the use of electric power which promise to transform farm life. Social implications are also involved, such as the decentralization of population and the alternation of farm with factory work. But financial barriers have held back wide-spread rural electrification. Chief

among these barriers are the farmer's small cash income coupled with the high cost of obtaining electric service. The latter is due particularly to the large investment required in distribution lines, with a small number of farmers per mile of line. Methods of overcoming these barriers lie along the following lines: (1) Initiative coming from the farmers themselves, either through joint-stock companies or distributing co-operatives. (2) Assistance from the government, chiefly in the sphere of better regulation of utilities and in the threat of public ownership, which serves to keep the companies alert to rural needs. (3) Organized research of a co-operative nature, with the initiative coming from the utility companies. (4) The extension of isolated fuel plants and small water power systems in remote districts where central station service is not possible. A survey of the situation in North Carolina indicates, among other things, that only one per cent of the farms in the state are equipped with electric service from central stations.

GEORGE EDGAR NEWBY: The Cotton Manufacturing Industry: New England and the South.

The problem treated in this study is that of making a specific comparison of New England and the South with regard to cotton manufacturing. The subject was suggested by the agitation which has been going on for a number of years relative to the South's remarkable growth in this important industry. The object here is to investigate the growth of the industry in the two sections during the past twenty-five years (that is, since 1899) and then to determine the comparative strength of the economic causes for this growth. The viewpoint is that of the manufacturer and is strictly comparative.

The problem is that of the localization of industry and resolves itself more particularly into a question of manufacturing costs. The two sections sell their products in the same market. The section which can manufacture more cheaply obviously has an advantage.

It has been found that the industry has grown much more rapidly in the South than in New England since 1899. The South is also diversifying its products and is developing facilities for the finishing of its goods.

The reasons for this more rapid growth in the South are found in the lower costs of labor, power, transportation, and in less burdensome taxation. New England has the advantages of lower capital costs, an early start, less fixed investment and keener marketing of products. Labor constitutes the big element of the South's differential.

The writer predicts that the future growth of the industry will be mainly in the South but no sudden decadence in New England is to be expected.

The method employed has been almost entirely the statistical one and quantitative data have been collected from reliable sources whenever possible. Such data have been presented in tabular form and by means of graphs, charts, and maps.

Merton Ogden Phillips, Jr.: The Webb-Pomerene Law: A Critical Analysis of Its History, Operation, and Economic Significance.

The purpose of this study is to place an evaluation upon the economic significance of the Webb-Pomerene Law. This is accomplished through an analysis of the historical-economic background of the law and the forces which led to its enactment together with a study of the law in operation.

American exporters, particularly the small manufacturers, had long been handicapped by their inability to combine or to cooperate in export trade. The desire to retain our war-born trade, impelled by a fear of the great power of foreign combinations, gave issue to the Webb-Pomerene Law.

The outstanding achievements of export associations operating under the law have been an increase in prices through the elimination of competition, an increase in the volume of business through the use of cooperative and large-scale exporting methods, and the reduction of costs through the elimination of duplicated effort and expense.

In placing an evaluation upon the law, certain inherent defects have been discovered, such as vague terminology, lack of administrative power to enforce the law, failure to equalize the tax burden on American exporters as compared with the burden on their foreign competitors, no provision for import combinations, and the necessity of including trade with the Philippines and Porto Rico as "export trade."

Certain economic implications have been pointed out, such as the dangers of discrimination and restraint in the domestic trade and the possibility of monopoly in our export trade. The danger of intensified international trade rivalry as a result of export combinations is also cited.

In appraising the economic significance of the law, it can be said that it represents a forward step in monopoly control. It is the only law of its kind to give a nation extraterritorial jurisdiction over its exporters, and the law insures fair play in foreign as well as in domestic trade. The practical results achieved by the associations operating under the Webb-Pomerene Law have more than justified its existence.

DEPARTMENT OF EDUCATION

Edgar W. Knight, who spent the past year on leave of absence on the Kenan Foundation for the purpose of studying schools in Scandinavia, is publishing some results of his study in the early fall of 1926.

Mr. Knight is directing the studies of several graduate students in American Educational History.

A. M. Jordan has directed during the years 1925-1926:

Mental, Physical, and Educational Growth of School Children in a Mill Village Community. This research work, which was made

possible by a subvention from the Laura Spelman Rockefeller Memorial Foundation, was reported last year. This investigation is progressing and expanding. W. D. GLENN continues in charge of the program of mental tests. A. M. MOSER has been placed in charge of the administration and interpretation of physical tests. It has thus been possible to introduce a series of physical tests under standard testing conditions. These tests are height, weight, strength of grip, (dynamometer), vital capacity (spirometer), a test of motor coordination (Dunlap's) and a measure of the chest. All of these tests have been made in one school in the grades I to VI.

All the mental tests reported last year are being continued. Some of the tentative results thus far follow:

The group tests have been found to be unusually reliable. The probable error of estimate has been found to be 5.5 I.Q. points on the consecutive half yearly measurements in the case of the Pintner-Cunningham Primary Test. It was feared that the giving of the same tests repeatedly would be accompanied by a substantial gain in the scores. Only the expected yearly increments of gain were obtained. The internal evidence from the tests has proven satisfactory. This is the case both in the Pintner-Cunningham test and the National Intelligence Tests.

F. C. SHEPARD is carrying on an investigation similar to the one just reported, the difference being that his physical, mental, and educational measurements are being made on children of a more favored community.

C. W. RIDEN is making similar mental, physical, and educational measurements on the children of a consolidated school in Chowan county.

A. M. JORDAN, W. D. GLENN and A. M. MOSER expect to have ready by fall a volume embodying the results of their investigations and those of others on the mental, physical, and educational status of children whose parents work in cotton mills. This volume will be printed by means of funds from the Rockefeller grant.

A. M. JORDAN is having published by the University of North Carolina Press a revised edition of his book, "Children's Interests in Reading." The new volume has about forty-five pages of new material which has been recently collected from the cities of Greensboro and Charlotte. About 1559 high school pupils of these two cities indicated what books and magazines they preferred.

These titles have been classified and reported in this volume.

Paul W. Terry has completed the following studies:

General Survey of Practices of Extra-Curricular Activities in Junior High Schools, Chap. III, Part II, *25th Yearbook of the National Society for the Study of Education,* February, 1926.

Data were submitted and discussed on the following topics: number of organizations, different kinds of activities, frequency of different activities, large and small programs, time for meetings, the home room organization and selection of advisors.

Cooperation of Teacher Advisors of Extra-Curricular Activities, Chap. IX, Part II, *25th Yearbook of the National Society for the Study of Education.* February, 1926.

This report presented data and interpretation on the following topics: attitude of teachers toward extra-curricular activities, selection of teacher sponsors, preparation for advisorship, responsibility of teachers for supervision of activities, and differences in supervisory loads.

Practices of Local Chapters of The National Honor Society, Chap. II, Part II, *25th Yearbook of the National Society for the Study of Education,* February, 1926.

Data were submitted on the following problems: extending membership to lower classes, basis of selecting members, and methods of measuring qualities.

Administration of Extra-Curricular Activities in the High School, I and II, *School Review,* Vol. XXXIII, No. 10, December, 1925, Pages 734-43; Volume XXXIV, No. 1, January, 1926, Pages 15-24.

Material was presented on the following topics: schedule provisions for meetings and other business, restrictive regulations, assistance of teacher sponsors, methods of enlisting teacher cooperation, supervision of participation and records of participation.

Extra-Curricular Activities in the Junior High School. *Warwick and York,* Baltimore, Md., June, 1926, Chapters I-VII.

This report presents data that are organized under the following chapter headings: Extra-Curricular Activities and Training for Citizenship, Description of Pupil Organizations, Programs of Activities, Organization and Supervision, The Home Room as an Administrative Unit, The Teacher Advisor, Unsolved Problems.

PROFESSOR TERRY has the following studies in progress:

History of Extra-Curricular Activities in American Schools: Early origins, theory and practice in early part of the 19th century, development of modern programs, etc.

American Society and the High School Program Activities: Organized community's demands in the high school educational program, demands of a democratic society on the organization and conduct of group life in school, etc.

The Cooperative Pupil Government Association: Analysis of typical forms and frequency of each, functions of, constitutional forms, rules, regulations and by-laws, methods of selecting representations, etc.

The following Masters' Theses were accepted by the Department during the year:

FRED MONROE ARROWOOD: The Development of the Guilford County School System.

The purpose of this study is to explain the development of the present Guilford County School System. In preparing the study the historical method has been followed. The first chapter contains a brief historical sketch of the county from its founding until the present. The second chapter deals with educational conditions up to and including the Civil War period. Chapter three deals with educational conditions during the period from 1865 to 1900. Chapter four discusses the status of education in the county in 1900 and its development up to the present. The fifth chapter is a discussion of the Guilford School Act of 1921, the two campaigns which finally resulted in its adoption by the county, and the county-wide educational program now being developed under the Guilford Act. The sixth chapter contains suggestions for strengthening the system.

The information for this study was secured, for the most part, from the files and papers of the Guilford County Historical Association, from Stockard's History of Guilford County, from the Reports of the Commissioner of Revenue for North Carolina, the United States Census Reports for 1840-1850-1870 and 1920, the General School Laws of North Carolina, the Reports of the State Superintendent of Public Instruction from 1853 to 1925, and the Records of the County Board of Education and the Reports of the County Superintendent of Education from 1900 to 1922.

ELLEN JONES CRAIG: Case Histories of Nine Retarded Students in the Hillsboro Schools.

This study presents the results from an experiment with nine eighth-grade students who were failing to make normal progress, because of deficiencies

in reading. Its purpose was to demonstrate that even those pupils most retarded in reading can be materially helped if the causes of their difficulties are ascertained and their individual needs thoroughly understood. By means of case studies, made under school conditions, the wide variation in the difficulties of poor readers was shown, and the need of specific individual remedial work demonstrated. Suggestions are also given concerning methods of carrying work in the average classroom and a detailed description of the diagnostic and remedial steps that should be taken in overcoming the difficulties encountered by the nine special cases studied.

The material on which this study is based was secured primarily through daily contact with students in the classroom, and by means of standard tests. The homes of the students were also visited and by means of informal talks with parents a great deal of valuable information was secured.

The important question was, were these nine students dull, or had they had a fair opportunity. Among this group of nine students no mentally deficient students were found, but their school histories prove that they have been been greatly handicapped by lack of school advantages.

Gilbert Craig: A Survey of the Hillsboro Public Schools.

The purpose of this survey was: (a) to point out to the school officials and to the public the actual conditions existing in the Hillsboro Public Schools; (b) to secure a definite body of facts and present them clearly and simply, for the school authorities to use as a basis for future financial and instructional policies; and (c) to make constructive recommendations for the future welfare of the schools based upon the facts presented.

Not only the weaknesses of the school system were investigated, but an earnest effort was made to explain the present system and to secure the interest and cooperation of the school officials and patrons.

The chief sources of information were the records of the County Superintendent and of the Hillsboro Superintendent. Standard tests were used to determine how well the individual needs of the students were being provided for. Personal conferences with the teachers and school officials also furnished much valuable data.

The conclusions reached in this study show that the needs of the Hillsboro schools are: (a) a more adequate system of records; (b) a more up-to-date financial accounting system; (c) a more elastic course of study; (d) a more flexible system of promotions; and (e) more time and emphasis given to supervision.

Lawrence Wooten Jarman: A Survey of the Rocky Mount High School.

This survey is divided into two parts, namely, a social and economic survey, and an educational survey. The social and economic survey consists of the chapter on the community, in which is clearly shown that the city of Rocky Mount has a large percentage of children to educate according to its popu-

lation; although having the ability to pay, it is clearly unwilling to do so, as indicated by the percentage of total disbursements expended for educational facilities.

The remaining chapters are an educational survey. Chapter II indicates that the principal is an office principal rather than a supervising principal. Chapter III shows that the teaching corps is changing yearly, that the teachers have a high academic preparation and some experience and that the salary has not been systematically increased for the past five years. That there is a very urgent need for a new high school building is revealed by Chapter IV, which shows that the building ranks low on a Strayer-Engelhardt Score Card. The enrollment of the Rocky Mount High School has increased practically fifty per cent during the past five years and the percentage of promotion is increasing. These facts are shown in Chapter V. The curriculum is compared with the state requirements and with the generally accepted principles governing constants and variables in Chapter VI.

Chapter VII contains these suggestions on the basis of the facts found in the first six chapters: (1) an increase in salary and provision for adequate buildings, (2) the employment of a stenographer to relieve the principal of his routine duties so that he may supervise the work of his teachers, (3) the adoption of a salary schedule so as to secure a longer tenure of teachers, (4) the erection of a Junior High School so as to reduce the elimination and retardation, (5) the revision of the offering so that the curriculum will fit the child instead of trying to fit the child to the curriculum.

A. M. Moser: Administration of Public Education in Buncombe County.

The purpose of this study is threefold: (1) to set forth as completely as possible the present status of education in Buncombe County, North Carolina; (2) to prepare and analyze the various items and factors entering into the administration and supervision of the schools, and (3) to offer practical suggestions for changes and adjustments that would make for greater efficiency and for further enriching and developing of the school system.

The first section contains a brief historical sketch of the county, along with a discussion of the social, economic, geographical, and political factors which have influenced the county. The second section deals with the present educational conditions in the county, and points out wherein the present educational system is strong or weak. The third section takes up the solution of the educational problems in the county, and a number of suggestions and plans are offered, along with a discussion of the methods and means of carrying these into effect. The fourth section gives a summary of the findings and sums up the various recommendations offered.

The changes and adjustments most needed in the county now are: (1) the county-wide plan of school support and school organization; (2) a uniform eight-months term for all county schools and a nine-months term for all standard high schools; (3) the use of standard tests and measurements for

the classification, promotion, and grading of pupils; (4) the consolidation of districts to form larger units of school work, and the organization of a number of junior high schools at strategic points; (5) a closer identification of the schools with the rural life of the county; (6) the improvement of library facilities, and added equipment for the teaching of vocational-agriculture, household arts and manual training.

Herbert Dale Pegg: A Study of Pupils' Abilities in English in Secondary Schools in Montgomery County, North Carolina, 1923.

The object of this investigation was to measure certain abilities in English possessed by the pupils in the secondary schools of Montgomery county and to make comparisons with the abilities of similar pupils in the secondary schools of other counties in North Carolina and elsewhere. This investigation was suggested chiefly by the results of a partial study made in 1923 of some of the abilities of high school seniors in North Carolina. An examination of the information obtained in the study of 1923 suggested the idea that interesting and instructive information might be obtained by pursuing a somewhat similar investigation in the field of high school English. Thereupon an investigation was planned including in its scope several aspects of the field of high school English in all grades of secondary schools in selected counties.

The method followed in the investigation was to administer five tests in English to the pupils in the high schools of selected counties, Montgomery, Warren, and Wake (omitting the Raleigh High School).

In a comparison of scores among the schools of Montgomery county, the Mount Gilead School made the most favorable showing. The other counties made scores comparing unfavorably with the standard scores of the tests.

Allowing for the total number of months of school attendance, however, the scores made by the pupils of the three counties compared favorably with the standard scores.

Such suggestions as arose from the study that may help to make high school English more effective in North Carolina have been included in the report.

Henderson Lee Thomas: Public Education in Craven County.

The location, soil, climate, population, commerce, industry, and agriculture of Craven county are described in the beginning as a background for the study. Educational conditions before 1840 are outlined showing the effects of the English poor laws on the education of the county. Examples of the operation of the apprenticeship system in the county have been used in an effort to reveal to what extent this method influenced the education of the poor. Private teachers were employed by the aristocrats, while the middle classes established the New Bern Academy in 1764. Other academies were organized before 1840, but little is known of their history and influence.

Craven county adopted the plan for a system of common schools provided for in the law of 1839, thereby becoming one of the pioneer counties in public education in North Carolina. Its ante-bellum school system was among the very best in the state, as comparative statistics for 1840, 1850 and 1861 show. The schools were closed about the year 1863 as a result of conditions brought on by the Civil War.

The schools were re-opened following the war, but only after extensive revision of the law of 1839. The carpet-baggers, scalawags and negroes controlled politics in Craven for some time after the war and retarded the growth of the white schools until the beginning of the next century. The Peabody Fund ministered, in a limited way, to the educational needs of the county from 1868 to 1876. Local self-government was restored to the tax payers in 1876, but the disastrous effects of reconstruction upon the educational system were not overcome until late in the century.

Samuel M. Brinson became county superintendent of schools in 1902 as successor to Dr. John S. Long, incumbent since 1881. The educational revival under Charles B. Aycock was just beginning in North Carolina and a period of rapid expansion of the schools in Craven soon took place. The school fund was increased from $10,000.00 in 1900 to $56,000.00 in 1910 and when the Brinson administration closed in 1918 the fund was $79,500.00. The consolidated school movement had its beginning in North Carolina at Thurman, Craven county, in 1911; the first real farm-life school in the state was established at Vanceboro in 1913.

The county board went on record in 1920 as favoring the county-wide plan of organization, administration, and support. The plan is in process of development and will be complete within two more years. Ten modern brick buildings have been erected during the past five years. The New Bern City schools have made steady progress but have hardly kept pace with the rural school growth of recent years. The expenditures for all school purposes, both rural and city, had increased to $393,000.00 in 1922.

RAWLEIGH LEWIS TREMAIN: The Development of the County Board of Education in North Carolina.

The purpose of this study was to trace the development of the county board of education in North Carolina and to indicate as definitely as possible the present status of that board. In order to show the development of the county board of education, it was necessary to deal briefly with the part played by the state in early education and to trace, through the Colonial and State Records, and Public Laws of North Carolina, the many changes regarding the board. Answers to questionnaires sent to county board members formed the basis for conclusions regarding the present status of the board.

The results of the study show that in the years from 1839 to the present time three separate names were used to designate the county board of education, besides those times in which the county board of commissioners assumed the duties of the county board of education; the size of the board varied but

little, being not more than ten nor less than three members; few qualifications for membership were imposed; five different methods of selecting members and four different lengths of term of office were tried; compensation ranged from nothing to five dollars per diem and mileage to and from meetings; and the powers and duties of the board were gradually increased as the changes of time demanded.

Answers to the questionnaire sent out to county board members indicate that at present above 93 per cent. of them are native North Carolinians, their median age is approximately fifty years, practically all are church members, their schooling ranges from one with no formal schooling to thirty-one who are college graduates, more are connected with farming and merchandising than with any other occupation, the median number of years spent at their present occupation is approximately twenty-five, the majority of the members have followed some other occupation previous to entering upon their present one, a little over half of them have held some other public position in the past and twenty-six do so at present, the median number of years served on the board is between three and four, the median valuation of property held by members is $15,735.00, and the median annual income is $2,781.00.

Recommendations are given regarding the number and selection of members, length of term, and powers.

DEPARTMENT OF ENGLISH

James F. Royster published in the July, 1926, issue of *Studies in Philology* (XXIII, 380-384) an identification of "Colle Tregetour," mentioned in line 1277 of Chaucer's *Hous of Fame.* The investigation has a possible bearing upon some important details of *The Frankeleyns Tale.*

Norman Foerster read a paper at Northwestern University, July, 1925, on "Walt Whitman: The New Pilgrim's Progress," showing how early the idea of a pilgrimage appeared in Whitman's writings and how the idea, freed from convention, became a regular feature of his "doctrine" till the end of his life. At the Chicago meeting of the Modern Language Association, December, 1925, he read a paper on "The Present State of American Literary History," which, in a revised form, was published in the *Saturday Review of Literature,* April 3, 1926, and again as a brochure by the Houghton Mifflin Co. In lectures given at the University of Illinois, April 21 and 22, on the "Crucial Years" of Emerson and Whitman, he tried to indicate the significance of these two leaders in connection with the problem of an American culture, Emerson representing mainly the European tradition and Whitman the frontier spirit, the

essential factors in the problem. In a paper read before the English Journal Club at the same place, April 22, on the literary criteria of J. R. Lowell, Mr. Foerster attempted a formulation of Lowell's creed in order to show that the man himself was inferior to his creed (reversing our usual assumption). In *Publications of the Modern Language Association,* Vol. XLI, No. 1, appeared an article on "Emerson on the Organic Principle in Art," and also a descriptive bibliography of contributions to scholarship in the field of American literature for the year 1925.

In the near future PROFESSOR FOERSTER purposes to complete a book on *American Critics* (Poe, Emerson, Lowell, Whitman), a critical exegesis of representative literary theories.

W. F. THRALL is studying the problem of priority of composition as between the Irish *Imram Curaig Maelduin* and the Latin *Navigatio Brendani.*

GEORGE C. TAYLOR has published during the year:

Shakspere's Debt to Montaigne. *Harvard University Press,* 1925.

Cites additional facts as to the vocabulary, phrase and thought relationship of Florio's Essays of Montaigne and Shakspere's drama.

Shakspere and Milton Again. *Studies in Philology,* April, 1926.

Offers new borrowings of Milton from Shakespere's plays, and contends for an increasing rather than a diminishing influence on the later poetry of Milton.

Nicholas Grimald's "Christus Redivivus" and the Hegge Resurrection Plays. Read before the members of the Modern Language Association of America, in Chicago, in December, 1925. (To appear shortly.)

Advances the suggestion that Grimald used the Hegge Plays in working up the Christus Redivivus.

HOWARD MUMFORD JONES. The American Attitude toward French Culture, 1750-1848. (In preparation.)

This study is designed to make a survey of the American reception of, and reaction to, the various elements of French culture as they were known to Americans in the period covered, although the seventeenth century is not ignored. Beginning with a general statement of the methods of comparative literary study, the book goes on to discuss the essential elements in the shaping

of American culture in the period, which are found to be three: (a) the cosmopolitan spirit; (b) the frontier spirit; (c) the middle class spirit. It is then inquired what knowledge of the French was available to Americans at these different levels. A large section of the study is devoted to assembling information about (a) the number of Frenchmen in the United States in the period and their contacts with the Americans and (b) the knowledge of the French language among the Americans. Next, points of contact are studied with respect to (a) social life and manners and amusements; (b) the arts, major and minor (ranging from cooking to architecture); (c) streams of influences in the fields of education, religion, and philosophy; (d) streams of influence in diplomacy and politics. Lastly, the American knowledge and criticism of French letters are traced. The total result of the monograph is intended to illumine the ways by which international understanding and misunderstanding arise.

Economics and Censorship. (Accepted for publication in *Social Forces.*)

A survey of varying systems of censorship in an attempt to indicate the basal relationship between the suppression of critical thought and the upholders of existing order. The study is designed to raise the question whether censorship has been, as it appears on the surface to be, a moral question. The paper points to the need of a good history of censorship.

Gregory L. Paine published this year:

The Indians of the Leather-Stocking Tales. *Studies in Philology.* XXIII, 16-39. (January, 1926.)

This article presents evidence that Cooper's knowledge of the Indian was obtained not from personal observation of savage tribes but chiefly from the reading of American history and travel. For his views concerning the Delawares and Iroquois, as presented in the Leather-Stocking Tales, Cooper was indebted to John Heckewelder's *An Account of the History, Manners, and Customs of the Indian Nations who once Inhabited Pennsylvania and the Neighboring States.* (1819.)

The article further shows that in the Leather-Stocking Tales the literary treatment of the Indian changes from realistic characterization in *The Pioneers* to idealistic characterization in *The Deerslayer.*

Professor Paine has in preparation an article on the character of Leather-Stocking, showing its complex nature, its several prototypes, and its significance in interpreting the American frontier. He is also investigating the influence of American travel literature upon the English poets of the later eighteenth and early nineteenth centuries.

BENJAMIN B. LANE has the following study in progress:

The controversy over realism in American letters, 1865-1894.

The changing character of the controversy will be traced, in magazines and letters generally, through a period of confusion in critical terms and standards to a definite statement of principles of realistic art by Howells, James and Garland.

F. T. THOMPSON has published:

Emerson's Indebtedness to Coleridge. *Studies in Philology.* XXIII: 55-76. (January, 1926.)

An effort was made to isolate what Emerson gained from Coleridge's philosophy, a philosophy in the main developed from that of Kant. Coleridge was also presented as a literary critic, with special reference to his criticism of Wordsworth.

LOUIS B. WRIGHT published during the year:

Notes on *Fulgens and Lucres*: New Light on the Interlude. *Modern Language Notes,* XLI, 97-100. (February, 1926.)

References to the improved social condition of actors are pointed out; the manner of the interlude's presentation between the intervals of a banquet is taken as an indication of the original definition of the term "interlude."

The following Masters' Theses were accepted by the Department during the year:

DAVID REID HODGIN: Henry Arthur Jones: Dramatist of the Middle Class.

It is the purpose of this thesis to establish and to relate to the history of modern drama the fact that Henry Arthur Jones is fundamentally a writer and dramatist of and for the middle class of English society; that his viewpoint is the ethical rather than the aesthetic; and that in his works the masses of average men become at once subject matter, audience, and controlling moral force of the drama.

The method pursued is that of analysis of his sixty produced plays, which for convenience are considered under three heads: Minor Plays, Serious Dramas, and Social Comedies, together with a consideration of his dramatic theory as expressed in prose writings.

Introducing this main body of the paper is a section devoted to the historical and theatrical background and to a biographical sketch of Jones, the man.

The conclusion undertakes to show Henry Arthur Jones as essentially isolated from the general trend of what is known as "modern" drama, and to

prove that he brings into the theatre the philosophy of the middle class, remaining throughout his dramatic career the interpreter of that class as it existed in late nineteenth-century England.

John Walker McCain, Jr.: The Origin, Development, and Uses of the Dramatic Prologue and Epilogue from the Greek Down to 1700, with Special Attention to their Significance During the Restoration.

This study has grown out of a desire to become familiar with the prologues and epilogues of the Restoration plays. The survey includes the Greek, Latin, and Earlier English introductory and concluding machinery.

The first section deals with the earliest suggestions of prologues and epilogues in Greek drama, the evolution of the pieces to a formalized type, the large part Euripides plays in this development, the manner of presentation of prologues and epilogues, the anticipations of modern forms, and the conventions that prevail.

A similar study treats of the Latin prologues and epilogues of Plautus, Terence and Seneca. This survey reveals a continuation of Greek forms, modified by many improvements in the perfection and dvelopment of the pieces; further adaptations to the growing needs of the stage; and the introduction of various new elements.

The early English mysteries, moralities, and other plays are studied in their relation to the development of the later English forms. Some consideration is given to the crude English introductions and conclusions, the conscious imitations of Latin and Greek prologues and epilogues, and the part early English writers play in the continuation of this development. A brief review of important Elizabethan and Jacobean prologues and epilogues is given as this field has already been studied.

The study of the prologues and epilogues from 1662 to 1700 naturally centers around the great master John Dryden. The forms of the Restoration are considered in relation to the following topics: the purposes of the prologues and epilogues; the forms employed in composition; by whom they are written; by whom delivered; how they are delivered; to whom addressed; and the price paid for them. The following themes are treated as subject matter: apologies for play, author, and actors; pleas for silence and for attention; political references and satire; social satire; satire on religion and parsons; references to the Collier controversy; literary controversy and criticism; reflections on the taste of the audience; explanations and defenses of dramatic forms and theories of composition; and playhouse reflections on properties, time of performance, price of admission, and conduct of audience.

The final discussion deals with the general popularity of the prologues and epilogues in the age of Dryden, and their special significance in the history of the drama.

Jessie McKee: Elements of Transcendentalism in the Writings of Herman Melville.

This investigation has been made for the purpose of discovering what influence the Transcendental Movement had on Herman Melville. The method adopted for the revelation of this influence is that of a careful study of his works as a basis. Such passages as seem to indicate either an interest in or a belief in the fundamental teachings of this doctrine have been quoted. The conclusions arrived at are as follows: (1) Melville was not an admitted Transcendentalist. (2) He had, so far as is known, no particular connection with the Transcendentalist Movement; but his works reveal the fact that a subtle influence was at work, which bore fruit in his writings and caused an almost unconscious tendency on his part to lean in the direction taken by the promoters of the movement. (3) His works are full of passages which may be quoted as evidence of this influence.

Leila McDuffie Prince: Milton's Synthesis of Material in *Paradise Lost.*

This thesis attempts to show how Milton put together the various materials used in *Paradise Lost* and how he welded such apparently incongruous ideas into a unified whole. Necessarily the discussion of this synthesis of materials is confined to certain aspects of the poem only and does not deal with its unity as a whole or concern itself with Milton's complete philosophy.

The study attempts to show, through citations and interpretations of passages and summary of criticism, how Milton fused and unified the materials used in *Paradise Lost,* and discusses, in order, his use of mythological and religious elements, personal references and lyric passages, along with his employment of his vast store of general knowledge, geographical, historical, cosmological and scientific, besides such minor elements as dramatic incidents and allegory.

The conclusion is reached that *Paradise Lost* possesses unity—artistic, expository, and aesthetic—and that this unity is attained by workmanship of a synthetic nature.

Richard Campbell Pettigrew: Influence of Wordsworth on Timrod.

The purpose of this thesis is to show to what extent Wordsworth influenced Timrod in his poetry and in his formulation of a theory of poetry. Chapter One is in the form of a preface, containing a statement of the writer's purpose. Chapter Two attempts to present the background for the ensuing study, showing that the environments of the young poet made him particularly susceptible to English influences. Chapter Three gives a brief survey of Timrod's life in the endeavor to trace his contact with Wordsworth. Chapter Four compares the respective theories of poetry of Timrod and Wordsworth, discovering that Timrod's theory is practically a copy of that of Wordsworth.

The second division of the chapter presents Timrod's criticisms of Wordsworth. Chapter Five examines Timrod's poetry, discovering a wealth of Wordsworthian influence. The conclusion reached by the writer is that Wordsworth's influence is manifested in verse form, in ideas, in attitude toward nature, and in actual, though unconscious, plagiarism.

Lou Sullivan Shine: Types of Humanity in Wordsworth's Poetry.

This thesis, which is a consideration of the different types of humanity portrayed in Wordsworth's poetry, attempts not only to show that Wordsworth represents the culmination of the interest of the eighteenth century poets in the obscure man but also to point out all the stages through which the poet worked to an ultimate outlook on society completely altered from that held in his more youthful years.

The first chapter discusses the status of the poor and humble as expressed in the poetry of Wordsworth's predecessors who prepared the way for him.

The second chapter has to do with Wordsworth's early poetry in which as a part of the rural scene itself is portrayed the plain man of the countryside in the homely district of his rearing, affected neither by wealth nor by class distinction.

The third chapter deals with the relation of man and society in the poet's Godwinian period: first, man as a product of society exemplifying "what man has made of man," and later, man conceived of as evil at heart and capable of enlisting the services of the intellect in opposing the forces of good.

Chapter four discusses the period in which Wordsworth concerned himself with those plain unaffected people whose souls had not been so "smooth-rubbed" by the play of abstraction that neither "form nor feeling, great or small" could cling to them.

Chapter five is concerned with the fact that during the glorification of the common man free from the "meddling intellect" Wordsworth had become more and more impressed with the dignity of human nature; with the genial power of the individual as selected from the great mass of mankind. Moving steadily toward humanism there is also evident in this period of Wordsworth's work a developing subordination of the emotional life to a life controlled by the will and tempered by judgment.

The last chapter deals with the period in which the poet's inclination toward conventional humanism had assumed sufficient proportions that such personages as the hero, the artist, the priest, the nobleman, and finally even the king himself are deemed worthy of commemoration in the late poems of Wordsworth.

The portrayal of these very varied types of humanity is interesting and illuminating as a revelation of the growth of the poet's mind.

The following Doctoral Dissertations were accepted during the year:

ROBERT RUSSELL POTTER: Some Aspects of the Supernatural in English Comedy from the Origins to 1642.

The purpose of this study is (1) to trace what may be called the social backgrounds of the supernatural in comedy, (2) to enquire into the comic use of the supernatural in the mystery and miracle plays, the moralities and the interludes, and (3) to study the dramatic use made of the supernatural in English comedy proper (including tragi-comedy and the pastoral) from the accession of Elizabeth, or thereabouts, to the closing of the theatres in 1642: (a) alchemists, astrologers, doctors; (b) magicians, conjurors and their devils; (c) witches and their demons; (d) fairies; (e) ghosts and dreams; (4) to formulate certain general critical conclusions regarding the use of the supernatural in comedy.

1. In order to understand the popularity of comedy scenes in which use is made of the supernatural it is necessary to appreciate the easy credulity of the time and also the deep-seated belief in the supernatural which has always characterized the English people. In the spacious days of Queen Elizabeth witches, conjurors, alchemists, magicians, astrologers, and quack doctors flourished in spite of the many decrees that were enacted against them. Nor was this credence a thing of recent growth: a general interest and belief in the supernatural was from the very beginning characteristic of the English people and is reflected in English literature from Beowulf to Shakspere, in English Law from the time of Eadward the Elder to that of James I, in English religious thought from St. Guthlac to the exorcists of King James's reign.

Only infrequently, though with growing insistence, did the voice of rationalism make itself heard: Chaucer in the fourteenth century; Heywood in the fifteenth; Scot, Gifford, Nashe, Greene, Jonson, Shakspere in the sixteenth.

2. In the mystery and miracle plays appear no ghosts, witches, magicians, conjurors, etc., figures which in the comedy of a later time were to become stage commonplaces. In these plays it is the devils and imps who, with their shouts and quips and crude horseplay, furnish the supernatural comedy. Originally, Lucifer himself was probably not a figure of comedy. He must have been intended to inspire awe and terror. But the devil of the plays was influenced by the devil of legend and folk-lore, and this latter devil was a creation of the mediaeval jokers and was close kin to the devils of such popular stories of those of Morgan Jones and Friar Rush. The result is that we find a dramatic figure the original significance and function of which was early lost in the very human desire to laugh at that which we fear.

The original function of the devils was, of course, to carry the damned souls to hell. Then were introduced the devils whose uproarious business it was to be made the butt of much boisterous horseplay. Finally it should be noted that some of these devils turn satirists (particularly those in the Chester

and Towneley cycles) ridiculing the inn-keeper who adulterates honest drink, the ugly woman who knows the use of cosmetics, the fool who dresses extravagantly and leaves his wife and children to starve, and other victims of the follies of the times.

Turning from the devil scenes, one finds very little comedy in these plays which involves the supernatural. Mak, in the Second Towneley Shepherd's play, says a mock spell over his sleeping companions; and his wife rings in the old belief in changelings to account for the presence of the lamb in the crib. Certain common-sensical characters react to the supernatural in a way that may have been—and in some cases must have been—humorous: the shepherds who argue about the angels' song, the Towneley and York Cain, the York Herod, the Joseph of the Towneley, York and N-Town plays.

In the moralities the concern of the writer was with metaphysical theology, with abstractions and not with reality. Thus there is scant humor in them. What humor there is, is furnished by the Vice, a descendant, in part at least, of the amusing demons of the mystery plays. Titivillus in *Mankind* is an excellent representative of his class. He is there primarily to furnish amusement, and his supernatural powers are limited.

In the interludes this character loses still more of whatever supernatural attributes he may have once had and tends to become merely a stock figure of horseplay and supposedly witty speeches. Thus it is with Idleness in *The Marriage of Wit and Wisdom,* Evil Counsel and Idle-ness in *John the Evangelist,* Courage in *Mary Magdalene,* Nicholas Newfangel in *Like Will to Like* and the Vice in Heywood's *Play of Love.* The important aspect of the interludes, from the point of view of this thesis, is to be found in the fact that, while there is no conscious use of the supernatural, there are a few scattered references which show that rational thought (not to gain headway for many years) was already to be found in the land. The chief single figure here, of course, is John Heywood.

3. In Elizabethan comedy much use is made of the supernatural, either for spectacular effects (as in such widely divergent plays as Shakspere's *The Tempest* and Robert Tailor's *Hog Hath Lost His Pearl*) or for purposes of satire (as in *Gammer Gurton's Needle, The Alchemist,* and *The Amyntas,* of Thomas Randolph.) But whatever use he wished to make of this material, the dramatist learned very early in the period that it was "good theatre", and he very soon came to realize that he had a never failing source for such material in the fable and ballad and folk-lore of his own country, in the Italian Renaissance comedy and the classics, and in the metrical and prose romances.

(a) Alchemists, Astrologers, Doctors. The period was not a time of specialization, and Misogonus and Stargaze—early and late representatives of the type—could profess to be masters of "all things in general". The prevailing attitude of the dramatists from Lyly to Randolph was one of scepticism and outright derision. The type received its first full treatment in those "early

plays from the Italian'', the *Buggbears* and *Misogonus;* its first definitely English presentation at the hands of John Lyly; its greatest and most artistic conception in Jonson's *The Alchemist.*

(b) Magicians, Conjurors, and their Devils. *Gammer Gurton's Needle* is the first regular English comedy in which significant use is made of this popular type. In *Dr. Faustus* Marlowe indicated the tragic use which might be made of the figure; but Greene caught the popular fancy with his *Friar Bacon and Friar Bungay* and indicated to the dramatists the comic possibilities of the conjuror and his devils. This was followed by such plays as *John a Kent, Merry Devil of Edmonton, Old Fortunatus, Grim the Collier, The Tempest, Devil is in It,* and *Devil is an Ass.* The satirical attitude flourished alongside the romantic; as a figure of contemporary life the conjuror was a fair butt for the dramatists' ridicule; as a figure of romance his position was equally secure.

(c) Witches and their Demons. The witch, although a vivid and lively figure in the popular imagination of the time, never achieved the popularity in comedy that the conjuror and magician did, and was of later growth, not entering the drama until 1584. She is essentially a creature of the realistic drama (she appears as an important figure in only one tragedy, in only one tragi-comedy, and in only one pastoral). Mother Bombie, the first English witch in comedy, although she appears in a romantic piece, is studied from real life; and of her numerous descendants the same may be said: the Wise Woman of Hodgson, the Witch of Paplewick, the Late Lancashire Witches, etc.

(d) Fairies. The fairies of English comedy are the fairies of English folk-lore. They are handled from three different points of view: (1) in certain plays, notably *A Midsummer Night's Dream,* a spirit of temporary acceptance is expected of the spectator; (2) in not a few the attitude is one of farcical, good-natured burlesque, as in *The Merry Wives of Windsor;* (3) in at least four plays the attitude is one of satirical farce. Lyly introduced the fairies onto the English stage and was followed by Greene, Shakspere, Jonson, Peter Hausted, and Thomas Randolph.

(e) Ghosts and Dreams. The figure of the ghost never achieved in comedy that wide popularity which it met in tragedy. Where it is used—significantly in only seven plays—its use is, with one exception, satirical. That exception is the Ghost of Jack in Peele's *Old Wives Tale.*

(f) In spite of the antiquity of dream-belief, dreams figure in but few comedies, and then, for the most part, but for satirical allusion. The reason for this is not far to seek: the dream does not lend itself readily to objective presentation.

4. In working out the problems suggested in the foregoing summary, certain general critical conclusions regarding the use of the supernatural in comedy have been reached:

(a) It is visible, and not invisible.

(b) It may assume different forms: the obviously superhuman, as devils, ghosts, fairies; the obviously human, as magicians, witches, enchanters; the inanimate, as rings, belts, love philtres.

(c) It is used, not to inspire terror and so purge the soul of mean emotions (as in tragedy) but (1) to amuse and entertain, and (2) to satirize certain vices and follies of the time.

(d) If used merely to amuse and entertain, the dramatist expects, and has the right to expect, at least temporary acceptance on the part of the reader or spectator. If used to satirize, the dramatist demands a certain critical and intellectual detachment on the part of the reader or spectator.

(e) In either case, as in tragedy, the effectiveness of an episode introducing the supernatural is "likely to be in direct proportion to its brevity". Thus the supernatural alternates with the natural, and Prospero, the enchanter, must share the stage with Prospero, the man, Oberon, the fairy prince, with Theseus, the mortal.

(f) In either case the use of the supernatural in comedy is closely bound up with traditional and contemporary beliefs.

Wilbur White Stout: The Progress of Linguistic Science Before 1700.

In undertaking to determine what contributions were made by English scholars to the scientific study of languages from c. 1500 to 1700—the period in which Latin grammar was escaping from the medieval domination of logical theory, and the interest in so many other languages was beginning—the first requirement is an extensive list of the books that were published. Consequently, the first section of this dissertation is bibliographical. It consists of a chronological checklist, giving the publication data on the various editions of books printed in England before the end of the seventeenth century. Since many of these books are now extremely rare, especially the early editions, the present location of copies is mentioned whenever possible.

The first chapter, of the four which cover the period by half-centuries, begins with the earliest circulation of printed dictionaries and grammars and leads down to the opening of the Stationers' Register. The facilities for the study of Latin, Greek, French, and English are considered in detail and in connection with such concomitant influences as the inheritance from the Middle Ages, the rise of humanism, and the use of foreign textbooks.

The second chapter continues the analysis for the reign of Elizabeth. In this age of experiment and abundant production the books published for the study of languages were naturally greater in number and superior in quality to those which they superseded. The number of languages studied was likewise increased. Among those taken up were Hebrew, Anglo-Saxon, Spanish, and Italian. Other factors considered in this chapter are the effect of printing and trade restrictions, the antiquarian movement, and the teaching of languages in schools.

The third chapter discusses the still more numerous, more elaborate, and more thorough treatises that appeared during the first half of the seventeenth century. Some attention is given to the various introductions, explanations, and supplements to standard textbooks that were being issued constantly. Not so many new languages were taken up during this period, but there was substantial advancement made in some of those already begun. The work in oriental languages, for example, was especially rich. Some of the related topics noticed in this chapter are the speculations over the confusion of tongues at the Tower of Babel, the growing interest in root words, and the popular demand for etymological definitions.

The last chapter considers the productions of the second half of the seventeenth century and presents the new scientific attitude. By the end of the century both popular demand and trade competition were forcing the writers of dictionaries and grammars to careful scholarship and systematic organization. One result was a steady stream of new and revised editions, each one supposed to be strictly up to date and more satisfactory than the preceding. The real progress was made, however, when linguistic sciences followed the example of the other sciences and regarded language objectively as a branch of natural phenomena, governed by natural laws of its own. The proper way of discovering the rules of a language, therefore, was by research.

LOUIS BOOKER WRIGHT: Vaudeville Elements in English Drama from the Origins until the Closing of the Theatres in 1642.

Students of English drama have known in a general way that the dramatists of the medieval and Elizabethan periods employed many tricks now common to the variety-show stage in the presentation of their plays. Previous to the present study, however, no one has systematically examined this variety-show material inserted in the drama, and no adequate presentation of the material has been made. The present discussion is an attempt to set forth the stage practices of the medieval and Elizabethan periods with reference to the employment of extraneous entertainment in the presentation of the plays; an effort is made to show how widespread was the use of such material and to point out its importance as a means of holding the interest of the heterogeneous crowds who witnessed the plays of the medieval and Elizabethan drama.

The term vaudeville embraces comic song, comic dancing, detached clownery, juggling, legerdemain, tumbling, feats of activity, fencing, the use of trained animals, etc., where such performances occur extraneously. Masques, dumb-shows, and the concluding jig are excluded from the present study.

The drama from the beginnings to the closing of the theatres in 1642 has been studied. Proof is offered of the presence of vaudeville elements in the religious drama, in the moralities, in the interludes, and in the fully developed drama. It is shown that this extraneous entertainment was inserted at the demand of popular taste; that dull plays were frequently enlivened by extraneous comic or spectacular matter; that there was no general sense of

impropriety in the employment of this matter even in serious plays; and that pre-Restoration dramatists sometimes took advantage of situations arising in plots to insert vaudeville scenes, such, for example, as turning a stage-fight into a fencing match. References in contemporary literature and the records of the players on the continent, in the provinces, at Court, and in the London theatres have been cited to show that the early actors combined the skill of variety-show entertainers with their regular dramatic repertoires.

The introductory chapter of this study discusses the conditions which were favorable to the insertion of vaudeville material in the drama: the inherited public taste for variety entertainment, the necessity of enlivening dull plays, the lack of fixed stage conventions, and the ease of transferring popular amusements to the theatres.

Chapter Two shows that strolling players made extensive use of variety entertainment in presenting plays in the provinces and on the Continent; that the vaudeville performances were to a considerable extent responsible for the popularity of the English comedians in Germany; and that strolling players on their return to the London playhouses continued to employ in the performance of plays extraneous matter which had proved popular abroad.

Chapter Three discusses extraneous clownery in stage-plays. The demand of public taste led to the insertion of buffoonery and detached clownery even in serious plays; occasionally producers added scenes of clownery where the original play was not sufficiently provided with comic matter. The use of clownery having little relation to main-plot or sub-plot was a practice so widespread that some dramatists, notably Shakespeare and Jonson, protested.

Chapter Four is a consideration of the use of extraneous song, for the most part comic. In addition to inter-act vocal music, extraneous songs were frequently interspersed in the action of plays. Clown songs are found as early as the mystery plays and seem to have increased in popularity as the drama developed. Comic songs furnished one of the most widely used means of diversion in the theatres.

Chapter Five presents evidences of the employment of acrobatics for the sake of spectacular entertainment in stage-plays. Dancing, tumbling, comic fights, beatings, wrestling, boxing, and fencing were employed in play performances, frequently without dramatic justification. Sometimes legitimate fights were exaggerated beyond dramatic necessity for the sake of the spectacle.

Chapter Six discusses the use of tricks of jugglery and conjury as a part of the extraneous entertainment in plays. Evidence proves the use of tricks of legerdemain in certain scenes of mutilation and in some stage executions. Sleight-of-hand tricks were presented sometimes before the play and sometimes in the course of the action.

Chapter Seven shows that animals, occasionally highly trained, sometimes appeared on the stage in the course of regular play performances.

The discussion attempts to show that the widespread practice of inserting extraneous variety-show material in the performance of plays accounts for many of the puzzling crudities in the plays of even the most skilled dramatists of the Elizabethan period.

DEPARTMENT OF GEOLOGY

W. F. PROUTY has continued his research during the year on the Triassic sediments of the Durham Basin.

JOEL H. SWARTZ has continued his studies of the Chattanooga black shale. A study of the Big Stone Gap shale of southwestern Virginia during the month of August, 1925, was made possible by a grant from the Graduate Research Fund. Studies of the paleontological and stratigraphical material collected at that time have been pursued throughout the year. A preliminary report was presented before the North Carolina Academy of Science.

The Chattanooga Shale of Southwestern Virginia. North Carolina Academy of Science, May 1, 1926.

The key to the Chattanooga shale problem, which has puzzled geologists for nearly three quarters of a century, lies in southwestern Virginia. A study of the shale of that locality has shown that the Big Stone Gap shale, the Virginian equivalent of the Chattanooga shale, is overlain, six miles northeast of Mendota, by typical Devonian deposits carrying Chemung fossils. It is thus definitely Devonian in age.

North of Mendota the Big Stone Gap shale, as far as it can be definitely traced, becomes more arenaceous and is accompanied by an increasing number of sandstone beds, both above and underneath it. An arenaceous black shale is found near Saltville at the base of the Chemung, accompanied by much sandstone and sandy shale. It appears to occupy the same stratigraphic horizon and is probably a further extension of the Big Stone Gap shale, which is thus recognised much further north than it had previously been known to exist.

Incomplete data appear to indicate that the Big Stone Gap shale east of Big Stone Gap represents the lower part of the Chattanooga shale of the type locality, Chattanooga, Tennessee.

Field work is being continued during June, 1926, in an effort to complete the solution of the problem.

In conjunction with the work on the Chattanooga shale an effort is being made to determine the Devono-Carboniferous boundary in southeastern, southern, and central United States.

Work is being continued on the application of the new method of stratigraphic correlation described last year. A large amount of material has been collected and is now being examined.

A new formula has been developed for the computation of rock thicknesses from traverse measurements, as described in the following paper:

A Self-Correcting Formula for the Calculation of Rock Thickness. North Carolina Academy of Science, May 1, 1926.

Although one of the most important and essential features of geological field work, traverse calculations of rock thickness have received entirely inadequate treatment in all but two papers. Even in these two articles a number of troublesome factors have been neglected. So many complications can enter such calculations that a self-correcting formula is seriously needed. The following formula,

$$t = D\cos\sigma\cos\beta\sin + D\sin\sigma\cos\delta$$

in which t is the thickness of the rocks traversed, D the traverse distance across their outcrops, σ the slope of the surface along which the measurement is made, β the angle between the dip direction and the traverse direction, and δ the dip, may be easily derived.

Two simple rules are to be observed in making the calculations:

1. Always measure β through 360° from the dip *direction* to the traverse *direction.*

2. Let σ always be *positive* when going *uphill* and *negative* when going *downhill.*

When these are followed, t will always be positive when ascending and negative when descending stratigraphically, regardless of the complexity of the factors involved.

The Age of the Universe. North Carolina Academy of Science, May 1, 1926.

If we assume that the energy radiated into space by the stars comes chiefly from the conversion of mass into energy as held by Einstein, Jeans, Eddington, Russell, and others, and that the differences in the average mass of stars in different stages of development are due to such mass conversion, we may immediately calculate the time required for a star to pass through any given stage of its life history from the formula

$$t = \frac{\Delta M\, c^2}{2.572 \times 10^{-4} M^{2/3} \rho^{2/3} T^4}$$

in which t is the time required to pass through a given stage of a star's development, ΔM the loss in mass during that stage (expressed in grams), c the velocity of light, and M, ρ, and T the average mass, density, and absolute temperature respectively of the star in that stage.

Calculations based on this formula give the length of time required for Russell's dwarf sequence (the "main sequence" of Eddington) as 66 trillion years. While not accurate, because of the uncertainty of the stellar data which must be used, the result at least indicates the order of magnitude of the time involved in stellar evolution.

Dr. Swartz is pursuing, in cooperation with Dr. Plyler, a study of the relationship of isotopes to crystal structure. In the same connection an attempt is being made to develop a method for the determination of the age of the earth.

The following Masters' Theses were accepted by the Department during the year:

Jefferson Bynum: The Climate of North Carolina and its Influence upon the Textile Industry within the State.

A study is made of the climatic conditions in the state which have a direct bearing on the manufacture of textiles. First, attention is called to the rainfall in the western part of the state just east of the Blue Ridge Mountains, and the gradual decrease as the coast is approached: 1. Western Division, 55-60 inches rainfall; 2. Piedmont Division, 45-50 inches rainfall; 3. Coastal Plain, average 45 inches.

Three factors are outstanding: 1. run-off due to deforestation; 2. elevation in west which adds to velocity of streams; 3. aside from dams or reservoirs, reforestation should be emphasized as a means of affording a continuous water supply for the generation of hydro-electric power.

The dangers from the rapid run-off and collection of water into streams are noted: 1. floods; 2. intermittent source of power; 3. sedimentation.

Since it is a recognized fact that artificial humidifiers must be used wherever textiles are manufactured, little attention need be paid to this question here. The cost of humidification in North Carolina is more than offset by the cost of heat and fuel in other regions.

Another and equally important factor considered in this study is the decreased cost of living among the operatives. For the the following reasons a man and his family are enabled to live for less money in North Carolina than in New England; 1. less money for clothes and fuel; 2. no expense for contending with snow and ice; 3. more time for gardening and the production of food. These advantages are due to a moderately uniform climate, leading to a much lower living cost.

A casual survey will disclose the fact that, while the textile manufactory of the South is not confined to any one state, the successful textile plants are almost wholly located within a certain section in the southern states. This region is known as the Piedmont Plateau. For this there are certain reasons: 1. altitude 600-1800 feet, producing mild winters and pleasant summers; 2. elevation sufficient to produce invigorating effects; 3. population of pure Anglo-Saxon stock of colonial American traditions, with but one-half of one per cent. foreign born; 4. no class consciousness or social isolation; 5. at present almost unlimited hydro-electric power.

While there is no reason for believing that the Southern States will ever have a monopoly of the American textile industry, the conclusions outlined

above point to the fact that the Piedmont section of North Carolina is well adapted for the development of the industry in all its branches. Finest as well as cheap fabrics can be successfully produced here.

Ivan Stowe Clark: The Geographic Aspects of the Tobacco Industry: A Study in Economic Geography.

Ever since colonial days tobacco culture has undergone a steady expansion in acreage and production, with a high degree of specialization.

The body of this thesis treats in detail the requirements with regard to soil and climate for particular kinds of tobacco needed for various purposes of manufacture and export. As a result of these factors, the growing of tobacco has become highly localized, each section supplying a particular type for a specific trade.

Imports of tobacco are comparatively large and have increased in the past ten years, but this amount barely exceeds 10% of the exports. These are large and are increasing, but they have not kept up with the increase in production.

Domestic consumption of tobacco has increased considerably for many years while during the world war production increased rapidly. Prices at that time were very high, falling off after the war because of over production, but are still above those of pre-war times.

Since the introduction of the machine-made cigarette in 1910 the manufacture of chewing and smoking mixtures has fallen off, consequently the increase in production of the bright flue-cured tobacco has been the result. The production of the other types has fallen off to some extent, but these have now entered the export trade.

Several of the foreign countries have started tobacco culture but in all cases have very little success, because of the lack of one or two of the following essentials: soil, climate, market, labor; expert knowledge in growing, grading, and manufacture.

The future seems to be that of greater specialization in the areas already producing tobacco and no future expansion of the culture.

Claud Stuart Johnston: The Orientation of Mineral Particles During Rock Flowage.

This work embodies a detailed study of available literature, and at the same time attempts, by experiment and observation, to throw some new light on the subject of rock cleavage. The work has proven to be largely a confirmation of preëxisting ideas and theories along the line of rock cleavage. Although no new or startling truths have been brought to light, there have, nevertheless, been opened up new fields of research.

The results of this work can be summarized in the following conclusions:

1. Unequidimensional particles will, when the matrix in which they are embedded is caused to flow, orient themselves so that their longer axes will point in the direction of flowage.

2. The angle that cleavage makes with respect to the force producing the shortening or elongation, will depend upon the amount of shortening or elongation, and will approach 90 degrees as a limit.

3. Growing crystals in a flowing solid or viscous material will be so oriented that their longer axes will be parallel and will point in the direction of flowage.

4. Unequidimensional crystals growing in a static solid will have their longer axes pointing in the direction of least resistance, which, apparently, may under certain conditions be in one plane, in which case parallelism and consequent cleavage will develop.

5. When sedimentary strata are folded by lateral pressure, so that the rocks are made to flow as a mass, the folds will have their axial planes inclined in the direction of flowage or elongation of the rock mass, and parallel to the cleavage planes. If, in a slate, the bedding planes or strata are more or less homogeneous, the cleavage will, in many cases, cross the bedding planes at an angle, as it would have to do to remain parallel to the direction of flowage.

6. Tension, as well as compression, when causing an elongation in a rock mass will give rise to parallelism in the unequidimensional particles.

7. Unequidimensional particles that are oriented because of flowage in the material will, in every case, be parallel to the direction of flow, which may or may not be normal to the direction of force producing the shortening or elongation.

Clarence E. Miller: Certain Problems connected with the Mineralogical Analysis of Kaolin Clays, and the Introduction of a New Method of Mechanical Analysis.

The work described was undertaken to work out a method of determining the mineralogical content of a Kaolin Clay and to develop a practical method by which the commercially available kaolin or clay substance in a raw clay may be ascertained.

A survey of the methods of mechanical and mineralogical analysis is given.

A new method of mechanical analysis is described. It combines the best features of the elutriator method developed by the Bureau of Mines and is quicker and requires less skill on the part of the analyst. The accuracy of the method was checked by analyses of refined clays ready for the potter, and by analyses of "made clays" of known clay content. By this method, the kaolin content can be determined within 2.0%. A constant experimental error of 1.5% due to extremely fine or colloidal clay passing through the filter paper was found. Since this material would be recovered to a large extent in the clay-washing plants, the efficiency of the method may be considered as 99.5%. The series of sieves used give the results as the amount of kaolin available to the commercial clay-washer, and the amount finer than 325 mesh. The method,

which is of the sedimentation type, requires between five and seven liters of water. The analysis, including a drying period of eight hours, may be made in nine hours.

A method of staining Kaolin Clay minerals as an aid in distinguishing them under the microscope is described. The method makes it comparatively easy to determine the amount of kaolin left in the sand separate and the amount of impurities in the washed clay. Two dyes, Safranine and Malachite Green, were found to be especially applicable. The absorption of various dyes by quartz, feldspar, mica, zeolites, kaolinite, bauxite, halloysite, and other clay minerals is given.

In the development of the mineralogical analysis, Rosenbusch's "cardboard method" of separating mica from sands was further improved, resulting in the designing of a new piece of apparatus. The apparatus is described. Successful separation of mica down to 80 mesh was obtained by use of the apparatus.

The following Doctor's Dissertation was accepted by the Department during the year:

Gerald R. MacCarthy: The Colors Produced by Iron in Minerals and in the Sediments.

The colors possessed by the majority of silicate minerals and by almost all sedimentary rocks are produced by various types of iron compounds. The generally accepted idea that the reds, browns, and yellows of such materials are caused by the presence of ferric compounds has been confirmed. The rarer blues occasionally found in silicate minerals and perhaps more often in clays and shales prove to be the result of the presence of hydrous ferro-ferric compounds, all compounds of this type seeming to be blue in color. Anhydrous ferro-ferric compounds appear to be, on the contrary, always gray or black in color, and since anhydrous compounds are more prevalent in igneous rocks than in sediments the more usual somber colors of such rocks is a direct result of the natural anhydrous ferro-ferrites and ferro-ferric silicates commonly found in them.

It is usually thought that ferrous silicate minerals are green in color, but no evidence of the existence of any green ferrous molecule has been obtained, such colors seeming always to be caused by a mixture of a blue hydrous ferro-ferric and a yellow ferric molecule, with or without the addition of a ferrous molecule. The presence of this latter type of compound will not affect the color of the rock or mineral to any extent since purely ferrous compounds are almost always colorless or nearly so.

An occasional slate, shale or clay is found which is purple in hue. This so-called purple coloring is of two types, a dark chocolate red produced by the mineral hematite (anhydrous ferric oxide) and a real purple which seems to be the result of a mixture of red ferric and blue ferro-ferric substances.

Red and yellow clays and sandstones owe their color to a thin coating of

colloidal ferric oxide (hematite and limonite) adhering to their surfaces. Since quartz will acquire a deep iron stain only in the absence of more active adsorbents, stained quartz does not usually occur in residual soils where such adsorbents are plentiful. It is found that the presence of certain alkali salts is required to cause kaolin, the basic mineral of clays, to become an active adsorbent of iron, a linear relationship between such alkali salts and the percentage of iron present in a series of clays having been noted.

Since colloidal iron compounds are rare in fresh rocks but common in weathered material it is suggested that the ratio between the colloidal and the non-colloidal iron in any soil or residual clay is a measure of the degree of weathering to which such material has been subjected.

DEPARTMENT OF GERMANIC LANGUAGES

E. C. METZENTHIN has continued his studies on the *Heliand* and Old Saxon during the year and made three contributions in this field.

A New Approach to the Home Problem of the Old Saxon Epic, the *Heliand,* a paper read before the Philological Club, November 3, 1925.

This paper was a preliminary report on a visit to some of the oldest monasteries and libraries of Central Europe in the summer of 1925, undertaken with financial aid from the Graduate Research Funds. The purpose of this visit was a three-fold one: 1. To become familiar with the local coloring, the linguistic peculiarities and the spiritual atmosphere of these monasteries which have been sponsored in previous publications by Germanists as possible or probable "Homes of the *Heliand*"; 2. To study the beginnings and early history of their libraries (9th century), see their manuscripts and search for some in the Old Saxon vernacular; 3. To look up and investigate any documents referring to the relation of the various cloisters to Emperor Louis the Pious, at whose behest the *Heliand* is supposed to have been composed.

PROFESSOR METZENTHIN has also completed another treatise on the same subject, The Home of the *Heliand.*

This treatise traces, in its first part, the failure of a century of scientific labor to localize the *Heliand* and shows as the main reason for this failure the limitation of the investigations almost exclusively to linguistic evidence in the manuscripts extant. In the second part it proposes a new and more promising method, based on topographical and especially on historical investigations into the political, religious, and literary atmosphere of possible "Homes", exemplifying the method tentatively on two prominently mentioned monasteries, Werden on the Ruhr and Corvey on the Weser, of which the former, although sponsored by some of the foremost Germanists, appears as a historical impossibility, while the latter furnishes some striking evidences for putting it on the map as an outstanding historical probability.

Professor Metzenthin has published as a contribution to *The Journal of English and Germanic Philology* an extended discussion of Edward B. Sehrt's *"Vollstaendiges Woerterbuch zum Heliand und zur altsaechischen Genesis"*, No. 14 of *"Hesperia" Schriften zur germanischen Philology*—with a thorough criticism of its arrangement and methods from a practical and scientific viewpoint and with suggestions for their improvement.

Professor Metzenthin has in preparation a "History of the Feminine Gender in Indo-European and Semitic Languages", dealing with the question of the relative priority or originality in the use of two or three genders or no gender, the conceptions underlying the differentiation of masculine and feminine nouns, the preference of certain vowels and consonants for feminine inflections, the trend toward, or away from, "sexlessness", etc.

John T. Krumpelmann read before the Philological Club in February, 1926, a paper on "German Inspiration in Bayard Taylor's 'Poems of the Orient' ".

(For abstract, see p. 97.)

Professor Krumpelmann has published during the year:

A note on "Goethe's Faust, 4203-4205", *Modern Language Notes,* XLI, 2, pp. 107-114, February, 1926.

At present Professor Krumpelmann is engaged in revising for publication a monograph on Bayard Taylor as a Literary Mediator between Germany and America (Harvard Dissertation, 1924).

DEPARTMENT OF HISTORY AND GOVERNMENT

J. G. de Roulhac Hamilton is still engaged in editorial work on The Papers of Randolph Shotwell.

He has edited a volume of selections from the writings of Thomas Jefferson, entitled *The Best Letters of Thomas Jefferson,* which was published by Houghton Mifflin in May.

He has also been engaged in studying certain phases of the lives of John Adams and Jefferson as revealed in their letters, some of which will be published during the summer.

W. W. Pierson, Jr., has completed during the year:

Scientific and Interpretative History (*North Carolina Historical Review,* May, 1926), a study in historiography.

Hispanic-American History—a Syllabus (University of North Carolina Press, 1926). This is a fourth edition, revised and greatly expanded. (In press.)

He has in preparation a series of studies in the history of the establishment and functioning of the Spanish colonial institution, the *Intendencia.* There will probably be four monographs, each to be accompanied with documents derived from the Spanish archives of Sevilla and Simancas.

The following graduate students, candidates for the doctorate, are working under the direction of PROFESSOR PIERSON:

W. S. JENKINS: Pro-Slavery Theory of the South, (See analysis of project, under Institute for Research in Social Science, pages 89-90.)

J. A. PADGETT: History of the Federal Election Laws.

C. B. ROBSON: Influence of Germany on American Political Theory.

R. D. W. CONNOR is engaged in the following studies:

History of North Carolina, 1663-1924.

A two-volume narrative history of the state with especial emphasis on its political, social, and economic development from 1900 to 1924.

The Life and Letters of Zebulon B. Vance.

To embrace besides the narrative of the chief events in Governor Vance's career, his most important speeches and messages and his public and private correspondence. The most valuable portion of the material embraces his private papers during his administration as war-governor of North Carolina, 1862-1865, which throw much new light on the history of the Civil War and especially on the points of controversy between the state and Confederate administrations.

The Papers of William Gaston.

An exceedingly valuable collection of the papers of one of North Carolina's most distinguished statesmen and jurists. The work of editing these papers was begun by the late Judge H. G. Connor and was left unfinished at his death. PROFESSOR CONNOR will carry it to completion.

PROFESSOR CONNOR is also directing the following study:

GUION GRIFFIS JOHNSON: Social History of North Carolina, 1800 to 1860. (Progress on Doctoral Dissertation.)

A critical study of social conditions in North Carolina during the period in which the social institutions of the state began to take on their modern forms. The project includes such subjects as population movements, social customs, the family, the school, the church, the plantation regime, the Negro, transportation, crime and punishment, reform movements, literature and art. Among the sources of data being used are published and unpublished legislative papers, state laws, town ordinances, court records, diaries, letter books, and newspapers.

C. P. Higby is engaged on a study of political, social, and economic conditions in Bavaria as an illustration of French influence on South Germany during the Napoleonic period. He recently received a grant from the American Council of Learned Societies to aid him in continuing this study.

Under the direction of Professor Higby, Mr. H. B. Field is engaged in a study of French influence on Spain during the Napoleonic period.

A. R. Newsome is at work on:

North Carolina during the War for Southern Independence.

The chief concern in this study is the social, economic and political, rather than military, history of the state from 1861 to 1865.

F. M. Green is engaged in the following study:

Constitutional Development in the South Prior to 1860. (Progress on Doctoral Dissertation. See Institute for Research in Social Science, page 90.)

Edward J. Woodhouse is engaged upon a study of certain phases and problems of municipal government in North Carolina. (See Institute for Research in Social Science, page 88.)

The following Masters' Theses were accepted by the Department during the year:

Otis Mack Brown: The Roman Religion and Cicero.

The Roman religion developed and expanded simultaneously with the city-state of Rome. The Romans at first were a primitive agricultural and pastoral people and all their gods and festivals had to do with those occupations. As Rome spread out over Italy, the gods of the captured cities were taken to Rome and given a place with the original gods of Rome. Many of the foreign deities were Greek. The "powers," as the Romans conceived their supernatural spirits to be, were transformed by Anthropomorphism into supermen and women.

During the Hannibalic war, the gods of the city were found to be unable to cope with the situation and to give the people the assurance and safety that they desired. They sought relief through foreign gods, and so many Greek gods were brought in that the Greek and Roman religion became amalgamated. After the crisis had passed, the old gods never recovered their former place in Rome. The gods were as much a mixture as the inhabitants of the city.

Various attempts to set aside the old state religion resulted in repressive measures. The state stepped in and kept the old worn-out ritual and forms going, long after they had ceased to express the real religious feelings of the people. Religion came to be used for political purposes and to stop or hinder unfavorable legislation to the party in power. This led to a peculiar religious situation, especially among the educated classes of which Cicero is a good example. For political purposes he believed in and supported the old state religion and regarded it as an essential part of the Roman constitution. As a philosopher he was an agnostic and a skeptic. In his private life he seems to have little regard or concern about religion and acts as if he is in no wise aware of a Supreme Being.

ELIZABETH GREGORY MCPHERSON: Edward Moseley: A Study in North Carolina Politics.

The purpose of this paper is to trace the action and reaction of the forces that entered into the formation of the political institutions of North Carolina during the first half of the eighteenth century. For this study was selected the career of Edward Moseley. To understand Moseley and the principles for which he stood, it is necessary to consider his ancestry, early life, education and other factors that have influenced his subsequent career. A summary of the chief events of his life from 1705 to 1749 show that he was a man of considerable ability who influenced colonial politics more than any of his contemporaries.

His career at the bar, the outstanding incidents of his public services, and his influence on legislation indicate his general attitude towards politics and government. Even his public services, other than political, show that he sincerely loved his adopted colony. This paper deals chiefly with his political career as a party leader. Such an interpretation of his leadership serves to explain the deep impressions his personality stamped on the political institutions and justifies the conspicuous place Moseley has been given in the colonial history of North Carolina.

ELEANOR SCHMIDT MOSHER: The Political Theories of Religious Toleration, 1776-1835.

The purpose of this study is to trace religio-civic history in the United States from 1776 to 1835 and to analyze political thought relative to religion.

A history of the attitude toward church establishment is traced through the first state constitutions. Then the federal constitutional basis for religious

liberty is discussed, showing the theory of the framers on the state-church relationship. The fundamental law of the land restrained Congress from enacting laws respecting the establishment of religion, but did not forbid the states to favor particular churches. A survey of the struggle in the various states in which the churches had been established shows that the people were slow to adopt sectarian equality. This has been brought out by an investigation of the constitutional changes made by the states. The older states gradually repealed laws of establishment and abolished religious qualifications for office holding. The new states took their lead from the federal constitution.

A study of the consequences of freedom upon the ecclesiastical organizations follows. With the acceptance of the theory that religion was voluntary and could not be forced, the churches accepted the theory of voluntary support, self-government and a freer choice in the matter of church membership. The new point of view necessitated changes in church polities and activities.

The next chapter shows how the political thought of this period had its parallel in the progress of thought in the field of religion. As a result, the theory of a free church in a free state, each a separate entity, was accepted.

In the final chapter the effort is made to show that, by the time church equality and complete separation of church and state were effected, new forces were setting in which savored of intolerance. The extreme individualism of the churches and the freedom from political restraint fostered material development and excessive loyalty to denominations, producing interdenominational intolerance. The state, exercising its police power or assuming the responsibility for the welfare of the people, has found that a proper relationship has to be maintained by law. Blasphemy laws, Sunday laws, laws governing the incorporation of church societies, and tax exemptions have resulted. By many, such legislation has been held to be intolerant.

ALBERT MONROE SNIDER: A Study of the Economic Conditions in Rome During the Revolution.

A dividing line between the old and new order of things in Rome may be fixed, more or less arbitrarily, at about 200 B. C. Following the Hannibalic War, the old economic and social order rapidly disappeared. The greatness of Rome was dependent on the small farmer and the labor of his hands. By about 100 B. C. the small farms in a great part had been absorbed by the *latifundia,* or large estates. Where once many small farmers, aided by their wives and children, cultivated their few *iugera* of land with their own hands, now vast *latifundia,* cultivated by gangs of slaves, spread out into the distance before the eyes of the traveler. In the tumbled-down villages within the sweep of the traveler's eyes, deserted now save by the shepherd-slaves who break their solitude as they wander here and there with their herds and their flocks, or perchance used as headquarters for slave gangs of neighboring *latifundia,* once lived the small farmers devoted to their homes, to their country, and to their gods.

The once small farmers, the backbone of the Roman State, are now *proletarii* clamoring for free grain at the Imperial crib, or rioting in the assembly to pass a measure advocated by some democratic leader or demagogue, or participating in a street riot as soldiers of some military hero.

Of all the efforts to remedy the situation only those of Tiberius Gracchus produced real and visible results, and these were soon swept away by the tendency of the times. Gaius' demagoguery only paved the way for Caesar and hastened the downfall of the Republic. A new era had culminated.

The Roman city-state had expanded into an empire, and Roman wants had increased in like proportion. Industry and commerce grew to meet these needs. A system of money-lending, banking, and exchange developed to meet the demand of expanding business over this wide-spread territory.

CORNELIA WEARN: Social Conditions in North Carolina in the 18th Century.

This thesis is a study of society in a southern rural and comparatively isolated community in colonial times. It is based entirely on primary sources, which include the Colonial records of North Carolina, colonial laws, diaries, the journals of travellers, church and court records, wills and inventories, and personal observations of extant colonial houses, relics, costumes, etc. The topics discussed include the race elements in the population; social classes; habits, houses, clothes, food, and other phases of domestic life; weddings and funerals; sports, recreations and diversions; education, libraries and other evidences of colonial culture.

The following Doctoral Dissertation was accepted by the Department during the year.

FRANCIS CHARLES ANSCOMBE: The Contribution of the Quakers to the Reconstruction of the South.

Part One of this work gives some account of the assistance rendered by the Quakers in Baltimore to their brethren in North Carolina, who had been impoverished during the Civil War. Refugees from the South passed through Baltimore on their way to the Middle West. Among them were many Friends, who reported the distress prevailing in North Carolina. Francis Thompson King, a business man of Baltimore, took the lead in organizing the Baltimore Association for the Relief of Distressed Friends in the Southern and Frontier States. The first phase of the activities of the Association was the rendering of immediate aid to the refugees, and the means to enable them to proceed to the Quaker communities in the Middle West. Committees were sent to the South, and as a result of the investigations extensive operations were undertaken. The Association concluded that the best form of assistance would be to enable the members of the Society to re-establish themselves upon their homesteads, and to restore the educational and religious work in their communities. They therefore discouraged further migration. Clothing, materials, tools, and seeds were distributed where needed, and medical aid was rendered.

John Scott, who had had extensive experience in educational work in Maryland, was the first agent sent into the field. He spent the winter of 1865-66 in this work. Joseph Moore, of Indiana, later President of Earlham College, Indiana, developed the educational work of the Association. Over seventy schools were established, and one annual report lists sixty-two schools, with 2233 pupils. Some of the teachers were from the north, but New Garden Boarding School, North Carolina, furnished a large number. The Association paid the salaries, furnished the school supplies, and constructed a number of school houses. The local communities boarded the teachers. The system extended from the coast of North Carolina across the mountains into Eastern Tennessee, where five schools were maintained. Assistance was rendered to some of the schools until 1881. The value of this service may be realized when it is recalled that the public school system of North Carolina was destroyed during the war. Normal schools were also conducted for many years, with an attendance of about one hundred. Steps were also taken to revive agriculture in the State. Land was purchased at Springfield, and a model farm was developed, with William A. Sampson in charge. New methods of farming were introduced, and agricultural institutes were held at various places. As a direct result, many farmers in Guilford, Randolph, and Forsythe Counties adopted modern methods.

New Garden Boarding School was materially aided by the Association. New buildings and new equipment were provided, and the nucleus of an endowment fund created. As a consequence, the institution entered into a broader field of service, and was chartered as Guilford College. Numerous meeting houses in many States were rebuilt by the Association. The exodus of the Quakers from the South, which had been general for many decades, was checked, and the Friends in North Carolina faced with more hope the task of repairing the wastage of war. The Association continued its labors till 1891, and spent $138,000. Of this sum, Friends in England and Ireland contributed $55,000. In this section, sketches are given of Francis King, Joseph Moore, and Allen Jay.

Part Two deals with the work of the Quakers for the freedmen. The women of Philadelphia Yearly Meeting were the first body of Friends to organize. Sewing circles were formed, and great quantities of clothing and supplies were sent to the various concentration camps in the South. The men Friends soon cooperated, and the Friends' Freedmen's Association of Philadelphia was organized. Extensive relief work was undertaken in Washington, D. C., and in the Peninsula of Virginia. Stores were opened at Hampton and Yorktown, where goods were sold to the freedmen at cost price. In sixteen months the sales amounted to $216,000. Mission centers were established, and educational work was undertaken in many places. A work of considerable importance was carried on at Danville, Virginia. In addition to the work in the National Capital, reconstruction work was carried on by the Philadelphia Friends at 153 centers in the Southern States, 246 workers being employed. The Association expended over $430,000. Work has been continued in one

center to the present. At Christiansburg, Virginia, Captain Charles S. Schaeffer, a Confederate officer, without knowing about the Quakers, came during the war to hold views similar to theirs on war and slavery. He started a school for freedmen, which has since his death been developed by the Philadelphia Association into an industrial and agricultural institution.

Relief and educational operations were also undertaken by the Friends of Indiana, Ohio, Western Iowa, New York, New England, and Baltimore Yearly meetings, each body having its own organization. English Friends contributed over a quarter of a million dollars, and the Irish Friends raised about $50,000. The Hicksite Friends also participated in similar work. In all, the Quakers contributed about a million and a half dollars to assist in the rehabilitation of the South. Particulars are given of relief operations in every State from Delaware to Texas, and numerous sketches are given of men and women who were conspicuous in this service. The author had the use of the original records of the Baltimore and Philadelphia Associations, and secured much of the data at the libraries of the Pennsylvania State Historical Society, and Guilford, Haverford, and Swarthmore Colleges.

DEPARTMENT OF MATHEMATICS

E. L. MACKIE spent the year 1924-25 on leave of absence at the University of Chicago. He began there under the direction of Professor Gilbert Ames Bliss a study of The Jacobi Condition for the Problem of Mayer with Variable End Points in the Calculus of Variations. This is being carried on, but has not been completed.

EDWARD T. BROWNE completed the following paper during the year: Involutions that Belong to a Linear Class. Presented to the Mathematics Section of The North Carolina Academy of Science at Raleigh, May 1.

This paper is a continuation of the paper on "General Properties of Involutions in n-ary Algebra" which was presented to the Academy at the 1925 meeting.

An involution is a projective correspondence of period two. Any matrix A, not itself a scalar, but whose square is a scalar, is the matrix of an involution. Every such matrix arises as the product of a constant (real or imaginary) by a matrix A which possesses the property

$$A^2 = I,$$

where I denotes the Unit Matrix, or the matrix of the Identical Transformation. If A and B are two matrices both of which possess the property that their squares are equal to the Identity, it is not in general true that

$$C = \frac{\lambda A + \mu B}{\lambda + \mu} \qquad (\lambda + \mu \neq 0)$$

also possesses this same property. If, however, A and B are such that C always does possess this property, we shall say that *A and B belong to a linear class.* In this paper a study is made of pairs of matrices A, B which belong to a linear class. The paper is primarily algebraic in its background, where the number of variables is *n*. For $n>4$, the algebraic results have no proper geometric interpretation, although for $n=3$, and $n=4$ the general theory leads to very interesting results in the plane and in space.

In this paper necessary and sufficient conditions (both from an algebraic and from a geometric standpoint) are found that A and B may belong to a linear class. A scheme is given for finding the total number of linearly independent fixed points that the two involutions have in common, together with a scheme for finding the distribution of these points. A similar scheme is given for planes. Finally, a complete study is made of the fixed points of the typical involution C of the class and their distribution relative to the fixed points of A and B.

The following Master's Thesis was accepted by the Department during the year:

LAURENS EARLE BUSH: Some Metric Properties of Conics.

The metric properties of a projective situation are brought out whenever infinite elements are introduced into the situation. This method is used to derive some of the metric properties of conics from their projective properties.

The metric properties of conics have for the most part to do with certain points and lines which are connected with the conic through the system of poles and polars determined by it.

Conics are classified as hyperbolas, parabolas, or ellipses with respect to the nature of their intersections with the line at infinity. If a conic is determined by five of its points, the class to which it belongs can be found by means of Steiner's construction for the intersections of a line with a conic. An analytic test for classifying conics by their equations in projective coordinates is derived.

Centers and diameters are discussed, and some of their properties are derived in a series of theorems. Some important properties of conjugate diameters are proved, and the axes of a conic are defined as perpendicular conjugate diameters. The circle is discussed with regard to its center and diameters, and it is shown to be a conic all of whose diameters are axes.

A focus of a conic is defined as a point such that every pair of conjugate lines passing through it are perpendicular to one another. From this definition it is shown that a central conic has, in the finite portion of the plane, two foci lying on the same axis, and a parabola, one, also on its axis; that the pairs of perpendicular conjugate lines of the plane determine on each axis an involution, and that the foci are the double points of one of these involutions, while the other has none. By means of this involution, several interesting properties of the foci are proved.

Equations and coordinates of the diameters, axes, centers, asymtotes, tangents, and normals are derived, and it is shown how by proper choice of reference elements the equation of the conic, as well as those of the points and lines connected with it, can be much simplified. Methods are also given for determining the classification of a conic from its equation in the canonical form.

The coordinates of the foci are derived, and it is shown that a central conic has, in addition to its two real foci on one axis, a pair of imaginary foci on the other axis; and that every point on the line at infinity satisfies the definition of a focus of a parabola. It is shown that the tangents from I and J intersect in the foci of the conic.

The paper ends with a brief historical sketch of the study of conics.

DEPARTMENT OF PHARMACOLOGY

W. de B. MACNIDER has completed the following papers, which have appeared during the current year or have been accepted for publication.

Concerning the Stability of the Acid-Base Equilibrium of the Blood in Pregnant Animals. *Journal of Experimental Medicine,* Vol. XLIII, 1:53, January 1, 1926.

A Preliminary Paper Concerning the Toxic Effect of Certain Alcoholic Beverages for the Kidney of Normal and Naturally Nephropathic Dogs. *Journal for Pharmacology and Experimental Therapeutics,* Vol. XXVI, 2:97, September, 1925.

The Chronic Nephropathy Induced by the Prolonged Administration of an Alcoholic Beverage. Recovery Experiments. *Proceedings of the Society for Experimental Biology and Medicine.* Vol. XXII, 52, 1925.

The Pharmacology of the Veratrum Viride with Certain Therapeutic Suggestions. *Southern Medicine and Surgery,* December, 1925.

The following research has been accepted for publication in the Abel Memorial Number of the *Journal for Pharmacology and Experimental Therapeutics*:

Studies Concerning the Value of a Solution of Glucose in Maintaining the Acid-Base Equilibrium of the Blood in Pregnant Animals. The Effect of a Period of Ether Anaesthesia in Pregnant Animals. The Protection Conferred by a Solution of Glucose.

The research which is now going on in the laboratory with the help of MR. S. T. HELMS and MRS. S. T. HELMS is primarily concerned with the production of certain types of chronic nephrites

in dogs; a study of the functional disturbance as indicated by changes in the urine and blood during the period of an acute injury until the animal becomes established as a chronic nephritic. Such studies mark an investigation to be undertaken of the recuperative power of the kidney and will likely throw some light on the mechanism by which various constituents of the urine are eliminated. These studies are being conducted under a grant from the Ella Sachs Plotz Foundation.

SCHOOL OF PHARMACY

E. V. Kyser has completed the following studies to be published in *The Journal of the American Pharmaceutical Association*:

Hydrogenated Oils: Their Substitution in the Ointment Bases of the Pharmacopœia. (With A. L. Gilreath.) A paper read before the Section on Practical and Dispensing Pharmacy of the American Pharmaceutical Association, Des Moines, September, 1925.

Some Vegetable Oils: Their Use in Conjunction with Hydrogenated Oils in the Production of Transparent Soaps. (With H. Amin.) A paper read before the Scientific Section of the American Pharmaceutical Association, September, 1925, and before the Elisha Mitchell Scientific Society, November, 1925.

The Volatile Oils from the Cultivated and Wild Varieties of *Mentha Citrata.* (With H. R. Totten.) This work is being carried on jointly with the Bureau of Plant Industry, U. S. Dept. of Agriculture.

Professor Kyser has the following studies in progress:

Comparative Value of the Sodium and Potassium Soaps from Stearic, Palmitic and Oleic Acids as Emulsifiers for Oil-Water Emulsions. (With F. C. Vilbrandt and W. D. Tennant.)

Methods for the Conversion of Menthone into Menthol in the Volatile Oil from *Mentha piperita.* (With C. R. Harris.)

Method of Increasing the Yield of Menthol from the Volatile Oil of *Mentha arvensis.* (With C. R. Harris.)

Methods of Refining Menhaden Fish Oil. (With Frank C. Vilbrandt and Charles Braubach.)

Comparative Data on the Analysis of the Volatile Oils from *Mentha arvensis.*

The Volatile Oil of *Lonicera japonica.*

The Volatile Oil of *Gardenia jasminoides.*

The Cultivation of *Mentha piperita* in North Carolina.

Hydrogenated Cocoanut Oil and Cocoanut Oil Butter as a Substitute for Lard in Iodine Ointment. (With J. A. Bullock.)

The Inhibitory Effect of Hexylresorcinol on the Activity of Certain Enzymes. (With M. W. Blades.)

The Climate and Soil Conditions of North Carolina for the Cultivation of Bergamot Mint. (With H. R. Totten and E. V. Howell.)

DEPARTMENT OF PHYSICS

OTTO STUHLMAN, JR., has published the following investigations during the year:

The Ultra and Extreme-Ultra-Violet Spectrum of Iron as Developed by the Inverse Photo-electric Effect. Read at the Meeting of the American Physical Society, Washington, April, 1926. *Physical Review.* (In press.)

A three-element vacuum tube of the commercial form VT-I, with platinum filament and iron grid and plate, was used. In series with the grid was a sensitive galvanometer and a variable potential whose negative terminal was connected to the negative end of the filament. A second circuit with the positive end of the battery connected to the positive and its negative terminal connected to the galvanometer served to keep the plate at a constant positive higher potential than the grid's positive potential. As a result of critically accelerating electrons emitted by the filament, towards the grid, monochromatic radiations are emitted, which are reabsorbed by the grid, resulting in photo-electric emission. Such emission and absorption interpretations are given the discontinuities which appear in the potential-current curves. They are evaluated by the usual $V\lambda = 12344$ relation. Using a work function for iron equal to 5 volts, the following spectral regions were reproduced. Spark spectrum of iron (Exner-Haschek, Spectren Tabellen) pronounced lines between 2456 and 2213. New lines between 2211 and 2154. Millikan, Bowen and Sawyer's Spark spectrum from 2152 to 880 A. The spectrum is being extended beyond 200 A.

The Modern Electrometer. *The Journal of the Elisha Mitchell Scientific Society.* (In press.)

A critical study of the theory, construction and operation of the modern modification of the quadrant electrometer, written in semipopular style. The aim of the article is to acquaint the electrical engineer, physicist and research technician with a simplified explanation of a very useful and exces-

sively sensitive electrical current and potential-measuring instrument, which because of lack of compiled information has always been considered as one of the most difficult instruments to handle.

Electronic and Gas Conduction. (Cooperative Contributing Expert.) International Critical Tables of Data of Physics, Chemistry and Technology. Vol. 2. (In press.)

Developing the Ultra-Violet Spectrum of Iron by Electron Bombardment. A paper read before the Elisha Mitchell Scientific Society, February 9, 1926.

A critical survey of the interpretations of critical-potential methods and an analysis of results obtained by using a three-element vacuum tube with platinum filament, iron grid and plate. The most pronounced excited states of the iron atom were identified as wave lengths attributed to the vacuum spark spectrum of iron.

PROFESSOR STUHLMAN has the following studies under way:

Extra-Ultra-Violet Spectrum of Iron by the inverse Photo-electric Effect. This problem is being financed by the University Committee on Scientific Research, through the generosity of the General Education Board.

The Ionization and Double Ionization Potentials of Iron.

This problem has been partly solved and points to a potential of 8 volts and 11 volts as the separation values of the first and second valence electrons.

E. K. PLYLER read the following paper before the American Physical Society at its meeting in Washington on April 23, 1926:

The Infra-Red Spectra of Brucite and Some Sulphates; Isotopic Effect.

By means of an infra-red spectrometer the structure of the absorption band of brucite $Mg(OH)_2$ was studied. The region of greatest absorption was found to be at 2.48 μ. Besides this maximum there were small maxima of absorption located at 2.40 μ, 2.30 μ, 2.14 μ. The maxima at 2.48 μ, 2.40 μ, and 2.30 μ, correspond approximately in position and absorption to the isotopes of Mg^{26}, Mg^{25}, and Mg^{26} as found by Aston. The small band at 2.14 μ, corresponds in position to Mg^{23}. However this isotope is not given. The work of Coblenz has been examined for the isotopic effect. In the reflection spectrum of nickel sulphate in solution there are two maxima located at 9.15 μ, and 9.50 μ. The second is more intense. These maxima are probably due to Ni^{58} and Ni^{60}. In the spectrum of potassium sulphate there are two maxima, one at 9.00 μ, and

the other at 9.40 μ. The maxima at 9.40 μ is much more intense. These two maxima are probably due to K^{39+41} and K^{39} taken twice. Other sulphates in solution showed only one maximum.

PERCY H. CARR: The Recovery of Selenium from the Effect of X-Rays. (Master's Thesis, June, 1926.)

A study of the recovery of selenium from the effect produced by X-rays has been made. It was found that for exposures of less than eight minutes the time of recovery is a logarithmic function of the time of exposure if the illumination is constant. Also, the time of recovery is a parabolic function of the effect produced by the excitation. For long exposures, the cell seems to undergo some permanent change, for it never returns to its original resistance.

The recovery curve obtained by plotting the resistance against the time as measured from the termination of excitation is very nearly a parabola. The effect curve obtained by plotting the effect against the logarithm of the time as measured from the beginning of the exposure shows that the effect is a parabolic function of the logarithm of the time.

Results are compared with those of Merritt, who has studied the recovery of selenium from the effect of light, and with those of Miss MacDowell, who has studied the recovery from the effect of X-rays. The results as found here compare favorably with theirs during the early and middle stages of the recovery, but during the latter stages the recovery is found to be more rapid than their results would indicate.

Moisture content of the cell seems to affect the sensitivity of the cell and the time required for complete recovery from excitation by X-rays.

J. DeL. FINKLEA: Some Methods of Generating Alternating Current with the Mercury Arc.

An experimental set-up of the Vreeland oscillator was made, and a series of tests was run to find its limitations. Its low efficiency was accounted for by losses unavoidable with the heavy currents demanded for stability and the small effect of the magnetic field on the arc drop. The equipment used proved incapable of oscillation at radio frequency. An oscillographic study of the anode ionization characteristics was made and showed pronounced fluctations which so far as known have not been previously taken into account with this oscillator.

The negative slope of the volt-ampere characteristic of the anode at low current densities was made use of to cause oscillations. This property was investigated mathematically and experimentally with the same conclusion; namely, that fairly steady but weak oscillations were possible. The energy output was too small to be of much practical value.

Further study was made of the anode characteristics of ionization about the anode, and its control by means of a grid enclosing the anode is proposed. Experimental tests on this were incomplete, however.

DEPARTMENT OF PSYCHOLOGY

J. F. Dashiell has published during the year the following papers:

A Quantitative Demonstration of Animal Drive. *Journal of Comparative Psychology,* V: 205-208.

Latter day developments of psychology have emphasized the energizing and motivating of human and animal behavior as fundamental to the description and interpretation of even the most subtle and complex processes. Unfortunately, the experimental demonstration of these drives has lagged behind their more general observation. Here a method has been devised for bringing out clearly and quantitatively the effect upon behavior of one of the simpler drives, hunger. White rats were divided into two groups, a 'fed' and a 'hungry', and were introduced one at a time into a maze-like apparatus in which their total of exploratory activity could be measured in terms of distance covered. Results on large groups of individuals show conclusively the drive character of hunger, and in a manner subjecting it to further quantitative variations.

Is the Cerebrum the Seat of Thinking? *Psychological Review,* XXXIII: 13-29.

As opposed to the traditional conception of thinking as a process occurring among neurones of the cerebral cortex, evidences and arguments were offered in support of a conception of it as not essentially different from other and easily observed processes of reaction in the human being. Exploratory reactions of overt type were shown to be continuous with exploratory reactions of more and more implicit types, including thinking; and the latter were described as the operation of sensori-motor mechanisms—as somatic rather than cerebral. Such a description accords well even with the findings of the introspective researches upon thought, by Watt, Marbe, etc.

The Learning by White Rats of an Inclined Plane Maze. *Journal of Comparative Psychology,* V: 397-405.

It has long been known that the white rat can learn complicated mazes without the use of extero-ceptive cues, and relying solely upon the proprio- (and possibly intero-) ceptive senses. The query raised was: can the latter avenue of stimulation function in a manner to make the animal sensitive to inclinations of the floor sufficiently to be used as a cue to learning? A maze was built offering the animal four alternative pathways similar in every regard except as to direction of inclination or slope (30 degrees from horizontal). By rotations of maze and of direction of inclination all possibilities of learning the way to food by any other cues were eliminated. In the course

of 200 trials definite corroborative evidence of the animals' learning to react positively to direction of inclination only was secured according to three different criteria.

English Bagby has conducted the following studies during the year:

The Field of Social Psychology. *Journal of Abnormal and Social Psychology,* XX, 384-390. (January, 1926.)

An analysis of the subject matter of articles and texts regarded by their authors as contributions within the field of Social Psychology reveals a complete disagreement as to the proper field of investigation in this branch of the science.

Three distinct schools have arisen. The first is represented typically by McDougall and gives consideration to "group" behavior. The second, represented by Gault, centers its interest in a wide range of problems relating to social welfare. A third school, which includes Allport, investigates the social factors in personality development.

An Experimental Study of the Causes of Failure in the Freshman Class of the Department of Engineering of the University of North Carolina. (Reported to the President of the University and to the Dean of the School of Engineering, January, 1926.)

It was shown that the failures are due primarily to inferior intelligence and to health factors. Time devoted to self-help does not seriously interfere with scholastic performance in the Engineering Department.

The following Masters' Theses were accepted by the Department during the year:

Karl C. Garrison: Some Experimental Work in Mental Set.

Mental set has been thought of as an attitude, a definite organic posture, an attentive response, or a particuluar neural pattern of reaction. Questions that this study attempted to throw light on were: (1) Is he who is the quickest to get into a task likely to be the fastest in performing the task? (2) Is there a significant difference in variability from individual to individual ir quickness of mental set, as compared with their variability in doing a particular task? (3) Is there a positive relationship between the same individual's quickness of mental set in one and in another group of tasks, the tasks involving different mental operations?

These questions were approached with the use of two forms (A and B) of printed arithmetic blanks, and mimeographed copies of tests taken from Forms A and B of the Otis and of the National Intelligence Tests. The tests from the A Forms were arranged in continuous order, while the tests from the

B Forms were arranged in mixed order. These materials were administered to the subjects by the group-test procedure, results being taken by the work limit, or by the time limit methods. (1) No significant correlations were found between speed in performing a task, and quickness of mental set. (2) Individuals varied more, from one to the other, in quickness of mental set than in speed of performing a particular task. (3) There were found positive correlations, within the individual's score, between quickness of mental set for different tasks; these correlations ranging from 21 ± 14 to 46 ± 14.

LUCILE CAROLINE SPEARS: An Experimental Study of the Ability of Children to Interpret Facial Expression of Emotion.

Previous experimental work by Gates in measuring the ability of children to interpret facial expressions of emotion had been done by essentially the same method which was used in similar work with adults. The child was shown a photograph depicting emotional facial expression and asked to tell what the picture expressed. The fact that the children scored markedly low in interpreting the more subtle emotions was taken as evidence that the discrepancy was due in some degree to difficulty in conveying the full extent of his comprehension. In order to make a more extended study of the child's understanding of facial expressions, and also to evaluate a method of procedure which would eliminate the vocabulary factor, story situations were worked out for the various pictures used.

Eighteen Ruckmick pictures were selected covering a wide range of facial expressions. Six Gates pictures were used in order that results might be compared; twelve other pictures, completing a wide range of facial expressions, were chosen to carry the experiment further. The pictures were divided into four series and a story written around each group. Each picture of the series showed a facial expression which might logically arise at a particular stage in its story. The story was first told to the child, and next the group of pictures was shown. In response to questions by the experimenter, the child selected the picture which portrayed the emotional expression corresponding to a definite incident in the story.

The results showed a decided improvement in the more even distribution of successes in the understanding of facial expressions than were obtained in the Gates experiment. This was especially true in those pictures in which the more subtle emotions were portrayed.

The findings in this experiment would seem to warrant the recommendation of the method for further study in this field.

The following Doctoral Dissertation was accepted by the Department during the year:

W. W. ROGERS: Factors Involved in the Formation of a Multiple Habit from Disparate Activities.

The activities that were formed into a habit consisted in turning off light switches on a board in front of the subject with the right hand, sorting blocks through slots that were screened from view with the left hand, and pedaling with the feet. These activities, thus, are disparate both in motor activities and in sensory cues. From the introspective reports of the subjects, and from the observation and experience by the experimenter in performing the multiple habit the cues were found to be visual for turning off lights, tactual and kinesthetic for sorting blocks, and kinesthetic for pedaling, with the auditory cue used for checking the accuracy of the pedaling. The performance of each unit of the three elements of the habit was electrically recorded by means of a triple marker on prepared paper placed on the revolving drum of a kymograph. Time was recorded by a Jaquet Chronometer. A pneumograph, fastened comfortably tight around the chest of the subject registered, by means of a Marey tambour, the respiration of the subject.

Thirteen subjects from the faculty and graduate students in Psychology were used in this experiment. Of this number four were girls and nine men. These subjects were given 50 practice periods: six were given one practice period a day, and six were given practice once a day for five days a week, while one subject practiced irregularly. After the 50 practice periods, each subject was given six control practice periods, the purpose of which was to test the degree of integration of the habit, to analyze the parts of the experiment for the effect of each element upon respiratory changes, and to test the emotional response of the subjects. Two of the subjects were given 100 practice periods.

Learning was fast during the first ten days of practice for 12 of the subjects. The remaining subject did not master the experiment until about the 25th practice. The learning can best be expressed in terms of the average time required to turn off one light, the average time required to sort one block, and the average time required to make one pedal stroke. No learning was noted in pedaling after the first five days of practice, except in regularity of pedaling. But learning manifested itself both in speed in turning off lights and in sorting blocks, and also in regularity of performing all three parts of the experiment. Probably since no attention was required for the pedaling at first, according to the introspective reports of the subjects, eight of the subjects lost their ability to pedal at some time during the experiment. In order to regain this ability to pedal, the subjects introspected that they had to keep their attention focally on pedaling for some time. Learning, however, did not progress smoothly after the first ten practice periods. The habit seemed to be on a plateau for the greater part of the last thirty or more practices, from which plateau one element would emerge usually alone and at the expense of some other element of the habit. From this new level of a given element of the habit there would be many lapses in speed to something near the old speed; but the average deviation would always be from the new high

level reached. Also the other part or parts of the habit would be brought up to a level commensurate with the first part. Not only did the subjects learn the three parts of the multiple habit, but they also learned to use respiration as a compensatory device in the performance of the task. The respiratory curves show comparatively slight changes during practice at first, but during the last 25 or 30 practices the irregularities of the respiratory curves increased markedly.

As a means of detecting emotion, the pneumograph with the Marey tambour is insufficient by itself. The respiratory changes during practice manifest themselves in three ways: (1) by a change in rate of respiration; (2) by a change in depth of respiration; and (3) by irregularities in change of direction during a given respiratory curve. The rate of respiration increased as the speed of the experiment increased; the rate of respiration tended to decrease during intense strain or emotional expression; decreased depth of respiration occurs during strain, during fixed attention with strain, and under conditions of emotional response by the subject; and great irregularities (abrupt changes of direction from inspiration to expiration or opposite during a given ordinary respiration) occur most frequently during times of strong sense-feeling of an unpleasant nature. Since unpleasant sense-feeling and emotion occur in this experiment as almost indistinguishable by the subject, these irregularities are called the emotional index.

The experiment illustrates well some personality mechanisms in the subjects used. An experiment of this type could well be used as a part test for temperament. The emotional depth, emotional strength, characteristic mood, and general emotional attitude were shown by the way the subjects went about the experiment, by the way they reacted to any blockage in the performance of the experiment, and by the use of the respiration as a compensatory device in the performance of the given task. Motility—tenacity, skill, style, hyperkinesis—hypokinesis—were shown for all the subjects during the experiment.

Only one subject fully integrated the three elements into a habit, as shown by the fact that he took on an added activity, that of adding aloud, during the fifty-first practice without loss of time in performing the multiple habit experiment and also without loss of time in adding. The other subjects showed all degrees of integration from that of no gain in the time required to perform the multiple habit experiment and to add separately, to only a slight loss in the time required to perform the multiple habit experiment alone. There seems to be no correlation between intelligence, as determined by the Roback Superior Adult test, and ability to integrate the multiple habit experiment. Rather, it seems from the tabulated data that the subjects react in their characteristic way to this as to any other test that is given them. Thus traits of personality and not intelligence determine the success of the integration.

DEPARTMENT OF ROMANCE LANGUAGES

WILLIAM M. DEY has continued his collaboration on the French Grammar by the late Prof. André Béziat of Vanderbilt University, and this book is now in press.

PROFESSOR DEY expects to have his edition of the poems of Alfred de Vigny ready for early publication, and he is preparing also an edition of some of the short stories of M. Pierre Mille.

STURGIS E. LEAVITT. Blasco Ibáñez: *Siete Cuentos.* Henry Holt & Co. 1926. XXI, 195.

A school edition of selected short stories of this popular author. Edited with introduction, notes and vocabulary.

H. D. LEARNED has been engaged in the following studies during the year:

A Critical List of Old French Loanwords in English to 1400 (reported in the last issue of this Bulletin). The work is being pushed as rapidly as the nature of the material and other circumstances permit. The first part of the study seems to indicate that the number of words referred by the NED to Old French sources is much too large; that, in fact, nearly one-half of these may be referred directly to Latin.

Du Bartas: A new edition of his complete works (in collaboration with U. T. HOLMES, JR.), based on the edition of 1611 and the previous editions of the sixteenth and early seventeenth centuries.

URBAN T. HOLMES, JR., completed during the year *pensum* 10 of the Old- and Middle-Irish Dictionary to be published under the direction of Professors Thurneysen and Pokorny of Germany and Professor F. N. Robinson of Harvard University. This comprised volumes 2, 3, and 4 of Windisch's *Irische Texte.*

PROFESSOR HOLMES has published during the year:

Die betonten Objektpronomina mit unpersönlichen Verben. Zeitschrift für Romanische Philologie, XLIV, 337-339.

A discussion of the occurrence of the accented form of the pronoun with impersonal verbs in the earlier Old French. There is a suggestion that this might possibly be a retention of *mihi* confused with *mei* from accented *me.*

Villon's Testament, Line 1194. *Modern Language Notes,* XLI, 116-118.

A further discussion of his theory that *de tusca,* occuring in the MS, is an error for *le tuscã.* The Tuscan is here identified with Pope Pius II, a Sienese.

PROFESSOR HOLMES has completed:

The Phonology of an English-speaking Child, to appear in *American Speech.*

A Possible Source for Branch I of the *Roman de Renard,* to appear in the April-June number of the *Romanic Review.*

Old French *de ne* to appear in *Language.*

The Vulgar Latin Question and the Origin of the Romance Tongues, to appear in *Studies in Philology.*

PROFESSOR HOLMES has read the following papers:

Who was Marie de France? Before the Philological Club. It is understood that what was said will require further investigation before it can be published.

The identity of Marie de France, author of the *Lais,* the *Espurgatoire Saint Patrice* and of a collection of Fables, has been a subject of research among many scholars. Among these should be mentioned Winkler, Fox and Levi. It is the writer's opinion that we can state with a fair degree of certainty: she was born in the Isle de France, of noble parentage, that she later lived and wrote in England, and that she flourished around 1170. If this is the case, why should we not expect to find her among the genealogical lists of the Isle de France, granting that these must contain a percentage of error? On making this search two things were ascertained: first, that the name Marie was not common among the women of noble birth, secondly, that one of the daughters of Galeran II, count of Meulent, bore this name. She married a Hue Talbot, possible baron of Colville (the writer's interpretation of the Cleuville given by Mas Latrie in his *Trésor de Chronologie*). Galeran was a noble of Norman family, dwelling on the border of the Isle de France, who was constantly in relations with Henry II of England. The Talbots crossed with the conqueror. Everything checks save that no other direct reference to Hue has been found. He must have lived a rather obscure life (perhaps overshadowed by his distinguished wife!). From a statement in the *Espurgatoire* it is evident that Marie was waiting at that time for her confessor, probably a Cistercian abbot. As the headquarters of this order were then at Sherborne in Dorsetshire we may well wonder whether her last days were not spent there.

If this theory is correct, that rare old castle at Houdenc, not far from Paris, should have been the abode of Marie's maternal grandfather, Amaury de Montfort. This would give it an added charm in our eyes.

The French Bibliography for Professor Jenkins' *The Current Year in Romance Linguistics,* read before the Mediaeval French section of the Modern Language Association, December 31, 1925.

PROFESSOR HOLMES has in preparation: A Manual of Old French Literature, Origins to 1300.

This has been in progress for two years and it is now complete in rough draft. Special effort has been made to give full expression to the researches of American scholars, as well as the newer theories from Europe. Aside from the first chapters of the Nitze and Dargan *History of French Literature,* which are necessarily brief, nothing of this sort now exists in English.

The French Element in the Scottish Vocabulary.

Material has been gathered from Jamieson's *Dictionary of the Scottish Language,* the publications of the Scottish Text Society, and various other sources. This portion of the labor is virtually complete.

A critical edition of the works of Du Bartas (with H. D. Learned and G. C. Taylor). A sum has been appropriated from the Graduate Research Fund to provide for photostats. Negotiations for these are under way.

N. B. ADAMS has published during the year the following studies:

Sidelights on the Spanish Theatres of the Eighteen-Thirties *Hispania,* Vol. IX, No. 1, 1926.

The prices paid authors for their plays, the salaries of actors, the appearance of the theatres, the habits of audiences, the particular difficulties of authors, actors and managers on account of governmental regulation are studied in some detail. The information was obtained mainly from contemporary periodicals consulted in the National Library of Madrid.

Some Plays of the Eighteen-Thirties in Madrid. *The Romanic Review,* Vol. XVII, No. 2, 1926.

During the period when Romanticism was the dominant literary movement in Spain, the Madrid stage offered at least eight varieties of plays which could not be classified as Romantic. The paper presents examples and discussions of these eight classes.

The following Masters' Theses were accepted by the Department during the year:

LEWIS B. STABLER: Historical Inaccuracies in Certain Plays of Victor Hugo.

Victor Hugo claimed for himself scrupulous exactitude in the use of historical data. That this is not true, a careful reading of his plays will show.

To what extent he was careless or indifferent in this regard one has no idea until a detailed critical study is made of several of his plays.

For the plays considered the writer has undertaken to make such a study. Short historical sketches are given. Sketches of characters in the plays are contrasted with the real characters of history and conclusions drawn. Historical data of the plays are checked against those of history and wherever discrepancies occur, these are noted.

The work is divided into four parts corresponding to the plays studied, two dealing with French history and two with Spanish history. "Le Roi S'Amuse" involves the reign of Francis I and the action occurs between 1520 and 1630. "Marion Delorme" is set in 1638 with Louis XIII and Richelieu appearing on the stage. "Hernani" portrays the election of Charles I of Spain as Emperor of the Holy Roman Empire under the title of Charles V. "Ruy Blas" depicts the corruption of the nobles and disintegration of Spain's glory under the weak Charles II, the action being put in the last part of the reign.

Of the major characters in these plays, Hugo has not given *one* that is altogether historically true. The mass of minor incidents, which the romanticists called "local color" and set so much store by, is no less filled with errors.

Clement Manly Woodard: A List of Latin Words Containing Open *e* and Open *o* in Accented Open Syllables.

The source of this list of words is Meyer-Lübke's *Romanisches Etymologisches Wörterbuch* and Körting's *Lateinisch-Romanisches Wörterbuch.* The list contains words that have come down in more than fifty Romance languages and dialects.

Each page of the list is divided into five columns. The first column contains the vowels in question, the second column contains the words with the accented vowels underlined, the third and fourth columns contain the serial numbers from Körting and Meyer-Lübke, and the fifth column contains descendants from the words which show the Vulgar Latin development of open *e* and open *o*.

In addition to the Latin words, a few Gallic and Germanic words are included. Greek words are omitted because of the uncertainty of the quality of the accented vowels.

Every known or supposed word with open *e* and open *o* is given, even though it had a closed syllable in Romance because of the dropping of a vowel or the influence of a yod.

The main Romance languages were found to be regular in the diphthongization of the vowels, but a very noticeable irregularity was found among the dialects.

In all, 658 words were considered. Of this number, 112 come down regularly to Modern French. Of the total number of words, there were found 214 Old French forms, 279 Spanish, 354 Italian, and 286 Provençal.

Forty-six words containing an accented *ae* were met with. Of these, only 9 show a diphthongized form in the majority of dialects. In two words, '*sae*ta' and 'bl*ae*sus,' *ae* was found to become close *e*.

There were found 106 words containing a yod. Of this number, 59 show no development whatever of the preceding vowel in the majority of dialects; 44 show a development of the vowel.

Descendants of the Latin words are given in the column at the right. This column contains as a rule only words that show a regular development. Words ending in *-eolus,-a,-um* and *-iolus,-a,-um*, usually developed regularly, and descendants of them, except in a few cases, are not given. When irregular forms are given, they are included in parentheses or described as learned. The main purpose was to give an Old French or a Modern French form of the word. If none was found, some other dialect form that showed a regular development was given.

T. EWELL WRIGHT: An Edition of Letters of Henry II of France, 1547-1553.

Although Henry II of France (reigned 1547-1559) was not an intellectual king, his letters deserve publication. Up to the present time there have been no editions except the meager volume of J. B. Gail, *Lettres Inédites de Henri II.* Paris, 1818, in which there are a few letters of minor importance. The extant letters are contained in more than two hundred and forty-six manuscripts ranging from France to Italy. The letters included in this edition are from manuscripts in the Bibliothèque Nationale and deal with the coming of Mary Stuart to France in 1548, the treaty with England in 1550, and the resumption of war in Italy in 1553.

This edition of fifteen letters concerns itself with Renaissance Paleography and Linguistics, though the completed work should be of some worth and importance to the historian. With this end in view an historical introduction explaining the relative setting of the letters is prefixed, indices of proper names and place names, and historic as well as linguistic notes are added. The text has been preserved intact with the exception of punctuation, and adequate accents are added for clarity.

DEPARTMENT OF RURAL SOCIAL-ECONOMICS

The *Year-book* of the North Carolina Club, 1925-1926 contains fourteen chapters under the title of Town and Country Interdependencies. A list of the chapters appears elsewhere.

The *University News Letter,* which goes weekly to about fifteen thousand people, carried tables and brief interpretations of 11 research studies of state-wide significance, and 7 studies of nation-wide interest.

COUNTY GOVERNMENT RESEARCH

Field surveys of County Government and County Affairs in North Carolina conducted by Paul W. Wager, Brandon Trussell, and Myron T. Green as research assistants, directed by E. C. Branson for the Institute for Research in Social Science, at the University of North Carolina. (See page 88).

Edgecombe, Surry, Polk, Burke, Rutherford, Alleghany, Ashe, Caldwell and Alamance Counties, by Mr. Wager.

Stanly, Macon, Pamlico, Craven, Gates, Washington, Pitt, New Hanover, Chowan, Beaufort and Alamance counties, by Mr. Trussell.

Union county, by Mr. Green.

During the next eighteen months this corps of Field Research assistants will have reported on half the counties of the state.

COUNTY STUDIES

1. Cartaret County: Historical Background, by Miss Aleeze Lefferts, Duplin county, H. C. Lay, Cartaret County, and C. W. Lewis, Cartaret county; Natural Resources, Farm Conditions and Practices, Food and Feed Production, by H. C. Lay; Industries and Opportunities, Schools, Wealth and Taxation, by C. W. Lewis; Facts about the Folks, Evidences of Progress, Problems and Solutions, by Miss Aleeze Lefferts.

2. Guilford County: Historical Background, Schools, Natural Resources, by W. C. Uzzell, Guilford County; Facts about the Folks, Wealth and Taxation, by C. W. Gold, Guilford County.

3. Mecklenburg County: Historical Background, by Miss Julia M. Alexander, Mecklenburg county; Natural Resources, by Mr. I. C. Clark, Orange County; Industries and Opportunities, by J. J. Rhyne, Gaston County; Facts about the Folks, by Edgar T. Thompson, Orange county; Wealth and Taxation, by A. T. Cutler, Orange County; Schools, by Brandon Trussell, Orange county; How Mecklenburg is Governed, by Paul W. Wager, Orange county; Farm Conditions and Practices, by F. S. Wilder, Orange county; Agencies and Institutions, by T. S. Clarkson, Mecklenburg county; Food and Feed Production, by Edgar T. Thompson.

STATE STUDIES

1. Progress in Public Education in North Carolina from 1899-1900 to 1923-1924.

2. State Government Finances, by S. H. Hobbs, Jr.

3. Farm Increases and Decreases: 1920-1925, by S. H. Hobbs, Jr.

4. Bonded Debt in North Carolina, by S. H. Hobbs, Jr.

5. Farm Tenancy in North Carolina: 1925, by S. H. Hobbs, Jr.

6. Dairy Cows in North Carolina: 1920-1925, by S. H. Hobbs, Jr.

7. Superior Court Convictions in North Carolina, by Miss Ethel Crew, Northhampton county, and F. S. Wilder, New Hampshire.

8. Superior Court Indictments in North Carolina, by Miss Ethel Crew, Northhampton county, and F. S. Wilder, New Hampshire.

9. Cattle on Farms in North Carolina: 1920-1925, by George Stephens, Buncombe county.

10. Liquor Law Violations in North Carolina, by Miss Ethel Crew, Northhampton county, and F. S. Wilder, New Hampshire.

11. Crime and Sectional Differences in North Carolina, by F. S. Wilder, New Hampshire.

12. Status of the North Carolina Poor White, by D. B. McLennan, Orange county.

13. The Country Store as a Social Center, by Miss Katie Lindsey, Durham county.

14. Western North Carolina: Economic and Social, by George Stephens, Buncombe county.

NATIONAL STUDIES

1. The Per-Inmate Cost of Almshouses: 1923 and 1924, by S. H. Hobbs, Jr.
2. Number of Farms in the Uninted States: 1925, by S. H. Hobbs, Jr.
3. Cost of State Government: 1924, by S. H. Hobbs, Jr.
4. Our Prison Inmates, January 1, 1923, by S. H. Hobbs, Jr.
5. Dairy Cows on Farms: 1925, by S. H. Hobbs, Jr.
6. Incomes in the United States: 1919, by S. H. Hobbs, Jr.
7. Radios on Farms, January 1, 1925, by S. H. Hobbs, Jr.

NORTH CAROLINA CLUB STUDIES

1. Leadership and the Reconciliation of Town-Country Interests, by Edgar T. Thompson, Orange county.

2. The Federation of Agencies and Institutions for Local Community Welfare, by A. M. Moser, Buncombe county.

3. The Rural Mind: Is it a Myth? by L. M. Brooks, Massachusetts.

4. Race Cooperation for Town and Country Advancement, by Arthur Raper, Davidson county.

5. The Small Town in History, by E. J. Woodhouse, Virginia.

6. County Planning, by F. S. Wilder, New Hampshire.

7. The Local Market Problem, by C. G. Grady, Johnston county.

8. Inter-community Relationships, by George Lawrence, Orange county.

9. Should the Consolidated School be Located in the Country or in the Town or Village? by Brandon Trussell, Texas.

10. A Community Program for the School, by A. M. Moser, Buncombe county.

11. A Community Program for the Church, by F. S. Wilder, New Hampshire.

12. A Community Program for the Bank, by Miss Katie Lindsey, Durham county.

13. Rural Use of Town Services, by Miss Verdie Noble, Duplin county.

14. Local History, by C. W. Edwards.

DEPARTMENT OF SOCIOLOGY

Howard W. Odum has published during the year the following:

Systems of Public Welfare (with D. W. Willard), University of North Carolina Press.

Negro Workaday Songs (with Guy B. Johnson), University of North Carolina Press.

The Influence of Christianity on Democracy and Government, in *The Outline of Christianity,* Bethlehem Publishers, Inc.

Professor Odum has contributed the following:

The Duel to the Death, *Social Forces,* September, 1925.

The Discovery of the People, *Social Forces,* December, 1925.

Down That Lonesome Road, *The Country Gentleman,* May, 1926.

Swing Low, Sweet Chariot, *The Country Gentleman,* March, 1926.

Professor Odum will publish shortly, as editor, "Masters of Social Science."

Professor Odum is collaborating in two special studies, one on Southern Folk Survivals, and another volume on the Negro and his songs. With Katherine Jocher he is working on "A Manual of Social Research."

J. F. Steiner has published during the year the following:

Community Organization. The Century Co., New York.

A text book describing the more important types of experiments in community organization and discussing the theories and principles involved in attempts to guide and control the growth of communities.

The Basis of Procedure in Rural Social Work.

A paper read before the American Sociological Society in New York, December, 1925, and published in the March, 1926, issue of *Social Forces.*

Explains why the attempts to establish a standardized procedure have failed. The intimate relationship between social and economic progress in rural communities is discussed and an effort is made to discover an administrative plan that is financially sound and adapted to the needs of the more isolated areas.

Coordination of Public Health Nursing and Social Work in Rural Communities.

A paper read before the American Health Congress in Atlantic City, May, 1926, and to be published in a forthcoming issue of *The Public Health Nurse.*

Advances the thesis that the rural situation demands the unified administration of public health and social work and the combination of functions of the public health nurse and the rural social worker.

Professor Steiner has also been directing a state-wide study of crime in North Carolina, one of the projects of the Institute for Research in Social Science. In cooperation with Mr. Roy M. Brown a monograph is being prepared on the Convict Chain Gang System. (See Institute for Research in Social Science, page 88.)

Roy M. Brown is continuing his study of the development and administration of poor relief in North Carolina. In cooperation with Professor Steiner he is making a study of county prison camps in the State.

The following Masters' Theses were accepted by the Department during the year:

Lee Marshall Brooks: The Administrative Cost of Crime, with Special Reference to Durham County.

The purpose of this study has been to bring together all the available data on the cost of crime throughout the United States. Attention was given to the administrative expenditures connected with police, court, and penal activities generally, and to these functions in Durham County specifically. Estimates dealing, during the past twenty-five years, with the ramifications of socio-economic crime costs are of only slight reliability, varying as these approximations do from $600,000,000 to $10,000,000,000 annually. Hence, another purpose in making this study was to construct crime-cost figures based on the maximum of facts and the minimum of guesses.

The indications are that police expense is the largest of the administrative items. While the court situation is the most difficult to appraise, it is clear that if court routine were brought more in line with general scientific progress, the expense would be reduced greatly. The penal institutions produce a heavy item of expense for the country as a whole; few prisons pay for themselves in any way.

In connection with crime in Durham County for the years 1923, 1924, and 1925, the total net administrative cost was found to be $61,156 annually, after deducting the surplus derived through Recorder's court costs and Convict Camp profits. The apportionment of the net administrative cost is as follows:

Police and Sheriff's Departments	82.5%
Courts	8.3
Jail and Workhouse	9.2
	100.0%

During the last decade Durham County has erected new buildings directly connected with crime at a capital outlay of more than $350,000.00.

The main conclusion is that apparent financial success in administering justice may be social failure in reality and of great cost ultimately; and that seeming economy in expenditures for police and prisons may result finally in social and economic waste far greater than would be the cost of providing the highest type of preventive and corrective efficiency equipment.

Robert Leslie Fritz: A Survey of the Hertford Community.

One of the vital problems now facing the South is that of making democracy equal in the out of the way places. With this theme in mind the Hertford survey was made. The purpose was to discover the needs of these smaller, representative communities with respect to location, population, and industry, and at the same time show how these shortcomings can best be met.

The source materials used in this survey were maps of Perquimans County; records of agriculture; interviews with prominent men of the town and county, including pastors, teachers, county superintendent of schools, county farm demonstrator, county home demonstration agent, farmers, merchants; court and town records; and county history. Forms for investigation covering the community schools and churches, both urban and rural, were used.

The conclusions reached are that the community, primarily an American farmers' village, has rich resources, a favorable location, good schools and churches, good roads, a dependable population, both white and colored, and in general a satisfied people.

The primary needs are: 1. More cooperation among business men. 2. More community spirit. 3. New industries. 4. Influx of intelligent farm labor—for the tendency is still away from rather than toward the farm. 5. Cooperative associations. 6. Better politics. 7. More scientific handling of the soil. 8. More capital.

With intensive cultivation of the soil, education for leadership, new interests in business and industry, and with its location along the new coastal highway, it has an assured future.

Aileen Gramling MacGill: A Statistical Analysis of Crime in North Carolina.

This monograph, based on sheriffs' monthly Jail Reports for the year 1924, includes a statistical report of crime committed from January, 1924, to January, 1925, in twenty-one counties of North Carolina. Because these counties were the only ones which sent in reports for the twelve consecutive months they were selected for this study.

From January, 1924, to January, 1925, 4,868 commitments were made to the jails in these counties. Of this number 48 per cent. were whites and 52 per cent. Negroes, 86 per cent. males and 14 per cent. females. The number of commitments per 1000 inhabitants ranged from 2.3 in Jones County to 23.5 in Transylvania.

Twenty-two offenders per hundred were imprisoned for violating the prohibition act, 14 per hundred for larceny and robbery, 9 per hundred for assaults, 8.5 per hundred for drunkenness, 6 per hundred for "Fornication, adultery and prostitution", and 3 per hundred for vagrancy.

During warm weather there was a 14 per cent. increase in the number of white offenders and 13 per cent. in the number of Negro offenders, 63 per cent. in the number of offences against morality and decency, 58 per cent. against public safety, and 34 per cent. against the person.

Embezzlement and forgery, driving while drunk, violation prohibition act, drunkenness, and vagrancy were committed by 50 per cent. more whites than Negroes. Assaults, burglary, arson, larceny and robbery, carrying concealed weapons, and gambling were the usual charges preferred against Negroes.

The median age of all offenders was 25.9 for all offenses. Of all offenders 24 per cent. were under 21 years of age.

While 50 per cent. of all prisoners spent an average of 2.86 days in the county jail, 1,354 prisoners were there one day only, although three remained for a period of one year.

The crime rate based on the jail statistics seems to be higher in the densely populated sections than in the sparsely settled counties.

Clyde Russell: Folk Interpretations of Social Values as Found in Folk Songs and Ballads.

As an index to folk interpretation of social values, a study has been made of ballads and folk songs as a medium through which is revealed a part of the thinking and attitudes of the people. The purpose is to study the evaluations of folk through this objective, viz., the folk song which is a composite expressive of the desires, wishes, aims, purposes, and ideals of individuals interacting with, stimulating, and being stimulated by other individuals. Out of this folk product comes an expression of those ideals which are common to the group and which give an index to their evaluations.

Approximately 5000 ballads have been examined. A comparatively intensive study was made of the ballads of the Southern Mountaineer, the Negro, the Cowboy, the Maine Lumberjack, the Mid-Westerner, the Indian, the French Canadian, the Serbian, and the Chinaman. Some of the ballads of the Creole, the Mexican, the Hawaiian, the Norwegian, the Armenian and several others were also examined.

The classification which has been used throughout the entire nine groups, in an attempt to find the underlying unity and harmony in this seeming medley, follows:

1. Love, Courtship, and Marriage. 2. Life, Work, and Play. 3. Religion, Ghosts, and Murder. 4. Reminiscences, Loneliness, and Homesickness. 5. Animals, Nature, and the Aesthetic. 6. War, Patriotism, and Legal Justice. 7. Provinciality, Local Tragedy, and Adventure. 8. Humor.

Francis S. Wilder: Types of Crime in North Carolina. A Statistical Analysis of Superior Court Reports.

This study is an analysis of the reports of the clerks of the superior courts of the several counties to the attorney general of North Carolina for the two years ending June 30, 1925. It presents figures and a discussion regarding types and the number of cases coming before the several superior courts of North Carolina together with the age, race, sex, and occupation of each person. This analysis is also made by counties and by sections, the state being divided into four sections of twenty-five counties each for the purposes of this study.

The analysis included all cases reported for the fiscal years indicated, or 14,484 in 1924 and 14,929 in 1925. The most common offenses of the 29,413 cases analyzed are (1) 7759 violations of the prohibition laws, (2) 3783 larcenies, (3) 2426 assaults with a deadly weapon, (4) 1602 for carrying a concealed weapon, and (5) 1500 for assault.

The race and sex distribution is as follows:

Race and Sex	1924	1925	Total
Total Cases	14,484	14,929	29,413
White Males	8,280	8,186	16,466
White Females	316	424	740
Negro Males	5,152	5,681	10,833
Negro Females	392	405	797
Indian Males	69	82	151
Indian Females	2	3	5

25% of the offenders were reported as being under 23.64 years of age, 50% as under 28.78 years of age, and 75% as under 36.36 years of age.

The occupational distribution which follows, while corresponding to the reports of the clerks, is not very accurate: 31%, farmers; 42.2%, unskilled laborers; 5%, textile hands; 3.8%, skilled tradesmen; 3.8%, commercially employed; and 3.1%, in personal or domestic service.

The study also includes a rating of crimes according to the median age of those committing each type, another in terms of the proportion of each race, and a third in terms of the proportion of farmers. Still another comparison is in terms of the proportion of crimes of different sorts in different sections of the state.

DEPARTMENT OF ZOOLOGY

H. V. Wilson has published, during the past year, the following reports on investigations:

Silicious and Horny Sponges collected by the U. S. Fisheries Steamer "Albatross" during the Philippine Expedition, 1907-10.

Smithsonian Institution, U. S. National Museum, Bulletin 100, Vol. 2, part 4, Pp. I-VII, 273-532, with 16 plates. Washington.

Studies on Dissociated Sponge Cells. *Year Book* of the Carnegie Institution of Washington for 1925. Pp. 242-246.

H. V. Wilson made exhibits of Tortugas (Florida) sponges, grown from artificially separated cells, at the annual meeting of the Carnegie Institution of Washington (Washington, December), at the annual meeting of the American Society of Zoologists (New Haven, December), and before the Elisha Mitchell Scientific Society (Chapel Hill, March).

He gave a paper entitled "A Preliminary Survey of the Sponge Fauna of Tortugas, Fla." before the North Carolina Academy of Science, meeting at Wake Forest, April.

R. E. Coker has continued studies of micro-crustacea, working at Beaufort and at Chapel Hill, has engaged in a revision of a previously published account of freshwater mussels, and, as acting chairman of a Committee of the National Research Council, has been cooperating with others in an inquiry concerning the general status of hydrobiology in America and the means of stimulating its development and of promoting its application. The following publications have appeared during the year.

Some Observations on Protozoa. *Journal of Elisha Mitchell Scientific Society,* Vol. 41: 42-3, September, 1925.

Fauna of Penikese Island, 1923. *Biological Bulletin,* 50, 1, January, 1925. (Editor and co-author.)

Report of a zoological survey of Penikese Island made by a party of 30 zoologists in connection with the celebration of the 50th anniversary of the founding of Agassiz's laboratory on Penikese.

Plankton Collections in Lake James, North Carolina—Copepods and Cladocera. *Journal of the Elisha Mitchell Scientific Society* 41: 225-258, Pls. 34-44. April, 1926.

INSTITUTE FOR RESEARCH IN SOCIAL SCIENCE

The increasing emphasis placed upon the social sciences within recent years and the need for scientific research in this field have given rise to a number of organizations for promoting research. Among these are such organizations as The Social Science Research Council and several of the national foundations which have set

aside major portions of their funds for this purpose. In history, government, economics, sociology, jurisprudence, anthropology, statistics, social psychology, and other related fields, there is need for new standards of research, for co-ordination, and for correlation.

At the University of North Carolina there has been for some time special need for assistance if the many investigations in the social sciences, already under way or projected, were to be carried out.

It was a fortunate circumstance, therefore, when the Laura Spelman Rockefeller Memorial in 1924 made a grant of $97,500 to the University of North Carolina, to be used over a period of three years, for the study of problems in the social sciences arising out of state and regional conditions. For the administration and expenditure of these funds, the President of the University set up an Institute for Research in Social Science, the main purpose of which was to assist faculty members in the prosecution of their research by means of research assistants, field expenses and clerical help. Research assistants with graduate training are the chief agents for carrying on the work of the Institute. Eight or ten are appointed each year on a twelve months' basis with an annual stipend of $1500. Each appointment is made for the purpose of advancing a specific piece of research.

In addition to the research work by faculty members and assistants, the Institute conducts seminars for the joint consideration of problems, and conferences and discussions by visiting experts. Among those who addressed the Institute seminar during the Spring Quarter were Henry R. Seager, Professor of Economics in Columbia University; Charles E. Merriam, Head of the Department of Political Science in the University of Chicago and Chairman of the Social Science Research Council; Ulrich B. Phillips, Professor of History in the University of Michigan; Clark Wissler, Curator-in-Chief, Department of Anthropology in the American Museum of Natural History and Professor of Anthropology in Yale University; J. Huizinga, Professor of History in the University of Leiden, the Netherlands, and Walton Hale Hamilton, Professor of Economics in the Robert Brookings Graduate School of Economics and Government.

NORTH CAROLINA CRIME STUDIES

Crime in North Carolina, including special studies of Negro and white offenders, is the subject of extensive investigations by Professor J. F. Steiner, Lee M. Brooks, Roy M. Brown, Ethel Crew, Arthur F. Raper and Francis S. Wilder.

The study includes the nature and scope of crime committed, the conditions under which the offenses were perpetrated as well as the individual offender's attitude toward his offense, the mental status of prisoners on the chain gangs and in institutions, and the cost to the state, county, city and town of the maintenance of police systems in their relation to crime, criminal courts, jails, prisons, chain gangs, and other penal and reformatory institutions. A comparison of crime rates between economic, social and industrial groups as well as between Negroes and whites, an analysis of the crime-producing factors in the individual and the group, and the establishment of a reliable foundation upon which government and social agencies may build constructive policies and programs in the prevention and treatment of crime and the criminals are some of the outstanding and concrete results which this study anticipates.

COUNTY GOVERNMENT

A detailed examination of county government and county affairs in North Carolina is demanding the attention of Professor E. C. Branson and his assistants, Brandon Trussell, Paul W. Wager, Myron Green, and Charles W. Edwards.

Analyses of county expenditures and practices, largely by an intensive study of courthouse records in selected counties of the state, have been in progress for more than a year. The results of this study in detailed reports on county finances and organization have been furnishing material for the recommendations of the special commission on county government appointed by the Governor. The counties already surveyed are: Alamance, Alleghany, Ashe, Beaufort, Burke, Caldwell, Chowan, Craven, Edgecombe, Gates, Macon, New Hanover, Pamlico, Perquimans, Pitt, Polk, Rutherford, Stanly, Surry, and Washington.

MUNICIPAL PROBLEMS

To obtain a clear exposition of the law in the practice of municipal government in North Carolina and to endeavor to explain why city government in the United States has frequently approached failure, Professor J. G. deR. Hamilton and Edward J. Woodhouse are making a critical analysis of the Law of Municipal Corporations of North Carolina and the municipal administration of typical cities.

The project involves the collection and study of documentary sources for the purpose of formulating tentatively the Law of Municipal Corporations of North Carolina and detailed surveys of selected cities in this state.

A SOCIAL HISTORY OF NORTH CAROLINA

Professor R. D. W. Connor and Guion Griffis Johnson are preparing a Social History of North Carolina from 1800 to 1860.

This volume will include chapters on population movement, social customs, the family, the school, the church, industry, the Negro, crime and punishment, and reform movements. The trend of public opinion in the past toward social problems and the manner in which these problems were met mark the emphasis and objective of this study, which will lay the basis for a similar study from 1860 to the present time.

FOLK-WAYS IN CENTRAL NORTH CAROLINA

A study of the folk customs, language and superstitions of the rural people in central North Carolina, is being conducted by Professor J. F. Royster and Elizabeth and Paul Green.

This analysis and interpretation of folk-ways purposes to set forth the relations of folk-customs, beliefs and superstitions to the life and habits of the rural people of this section, as shown in their medicine, hygiene, farming, religious and domestic activities. It is also planned to make comparisons with the lore of other sections, where less literate people are of similar ancestry, and to observe the effects of education and social contacts upon such survivals.

STATE AID IN RAILROAD BUILDING

Professor D. D. Carroll and Cecil K. Brown are making a detailed historical study of railroad projects in North Carolina which the state aided with funds.

Special attention is being centered on The North Carolina Railroad, The Atlantic and North Carolina Railroad, and the Western North Carolina Railroad as forming a "State System." The study sets forth the factors which impelled the state to extend financial aid to certain railroads, the degree of efficiency of operation, the political aspects, why the state abandoned the railroad business, and attempts an evaluation of the success or failure of the state's undertaking. This investigation covers an important phase of the history of transportation in North Carolina.

POLITICAL THEORIES OF THE SLAVE-HOLDING SOUTH

An investigation of political theories of the slave-holding South and their relation to post-bellum theory and practices is claiming the attention of Professor W. W. Pierson, Jr., and William S. Jenkins.

Analysis, classification and formulation of these theories and the conditions under which they originated, together with the political and social influence, both state and national, which they wielded, will be set forth in this volume. This study will bring out the effects of southern political theories on the southern attitude toward such problems as public education, labor legislation, suffrage, the tariff, the money question, and the relation between state and nation.

THE MILL VILLAGE

Mill village population in North Carolina is the subject of special research by Professors W. J. Matherly and J. F. Steiner, and Jennings J. Rhyne.

An historical sketch of the development of the mill village in the South and the growth of the textile industry in North Carolina, an exhaustive survey of the social, economic, religious and educational status of cotton mill operatives, and the determination and analysis of certain factors of social disorganization apparent in mill village life are given attention in this study. Valuable background material for similar studies in North Carolina and the South and for comparative studies with other parts of the country is being secured, and a scientific method for the investigation of such problems worked out.

CONSTITUTIONAL DEVELOPMENT IN THE SOUTH PRIOR TO 1860

An examination of the social, political and economic conditions out of which the first state constitutions in the South arose is in progress by Professors J. G. deR. Hamilton and R. D. W. Connor, and Fletcher M. Green.

The evolution and analysis of these early constitutions and the factors affecting their development, together with an analysis and a comparative study of the constitutions of 1860, cover the main features of this research. The study will set forth the peculiar regional, provincial and sectional development of the Southern States as expressed in their constitutions, and will call to attention the social, political and economic factors which led to the evolution of democracy in the South.

THE NEGRO

Professor Howard W. Odum and Guy B. Johnson are undertaking comprehensive background and source studies of the Negro.

Their researches include two volumes, one *The Negro and His Songs* and another *Negro Workaday Songs;* other background studies of Negro folk life; investigations of Negro population in the larger cities of the United States and in exclusively Negro towns; and the compilation of source materials for the study of the Negro in America. The analysis, classification and com-

parison of Negro songs provides authentic and valuable background material to portray Negro life and to obtain better insight into his temperament; the population studies show facts of Negro migration as well as of segregation; while the source book will present in a single volume comprehensive data for the treatment of the Negro. Reference has already been made to special studies of Negro crime. In addition special case studies of Negro offenders and of certain aspects of Negro crime are also under way. Other case studies of the Negro migrant are being planned.

STUDIES IN NEGRO BUSINESS PROBLEMS

The Department of Economics and Commerce has formulated a program of studies in the field of Negro business in the South, which is now being investigated by Thomas W. Holland under the direction of Professor Walter J. Matherly.

This study includes a survey of the number of Negro enterprises, the forms of organization, types of business, capitalization, volume of business, employees, etc., as well as intensive case studies of two hundred organizations.

Closely correlated with this investigation is an inquiry into credit facilities for Negroes in the South to be made by Roland B. Eutsler under the direction of Professor Claudius T. Murchison.

In order to determine the Negroes' command of credit bases, the extent of their business, agricultural activities, property ownership and income, a detailed study of the present availability of Negro credit from "white owned" agencies, as well as the adequacy of Negro facilities, will be undertaken.

PHOTOPHONOGRAPHIC STUDIES

Coöperating with Professor Carl Seashore and Dr. Milton Metfessel, of Iowa State University, Professor Howard W. Odum and Guy B. Johnson have made studies of more than a score of types of Negro singing, providing material for Doctors Seashore and Metfessel to make photophonographic records, musical notations and moving pictures of Negro singers. The experiment was made largely at Chapel Hill, with one group of singers at Hampton, and is reported as being successful.

MENTAL AND PHYSICAL GROWTH OF SCHOOL CHILDREN

This study, which takes into consideration the effects of environment, is under the direction of Professor A. M. Jordan and two assistants, W. D. Glenn and A. M. Moser.

Tests of mental alertness, of educational accomplishment, and of physical development are being administered twice each year to a group of children

whose parents work in cotton mills. The work covers a period of three years. Other studies of a similar nature are being made with children whose parents are farmers, and with others whose parents are composed largely of teachers. The study proposes to establish the effect of environmental factors on mental and physical growth and to ascertain the degree of correlation between mental and physical growth. Furthermore, by following the same children through a period of years it will be possible to see the effect of the school in producing mental growth in a favorable and in an unfavorable environment. It is also hoped to make a careful study of the mental capacity of these groups of children who have such different home influences.

A HISTORY OF INDUSTRIAL SOCIAL WORK

A history and description of industrial welfare work in the textile South has been begun by Harriet L. Herring with the cooperation of Professor Howard W. Odum.

The object of the study is to secure as complete a history as possible of early welfare work in North Carolina and the South; to discuss and note stages of development up to the present elaborate schemes; and to present statistics of welfare activities. The data secured will form the basis for comparative statistics of welfare work in other states and other sections of the country.

WORKMEN'S COMPENSATION

The primary purpose of this study, which has been done by Professor M. L. Ferson and Mr. Robert McPheeters, is to point out some of the advantages and disadvantages that would accrue to North Carolina if such a law were enacted.

In order to show the existing conditions, the simplest method of approach has been to make an analytical study of the more recent cases, decided by the North Carolina Supreme Court, which would have come under a Workmen's Compensation Act; the results obtained under the average compensation statute; and the advantages for and against Workmen's Compensation. It is believed that after analyzing the results of the present system of settling personal injuries to employees in North Carolina industry, namely, by the customary damage suit for personal injuries and comparing these results with those obtained under a Compensation Act, a fair case for or against the adoption of such a law can be secured.

OUTLINES OF SOCIAL RESEARCH

Katharine Jocher, in collaboration with Professor Howard W. Odum, is compiling a comprehensive outline of social research, with special reference to Institute problems and methods.

The volume will contain chapters on the spirit of scientific research; social research and the new alignment of the social sciences; the historical approach to the social sources; the qualifications of the social research specialist; the divisions and general methods of social science; types of method and approach including the statistical, the survey, the experimental, the case, the biological, the psychological, the comparative, and the historical; the range of general sources; research agencies and groups; reading and bibliography as tools; the utilization of notes and records; schedules, questionnaires, and forms; common sense technique; preparation of manuscript and publication; examples of social research and bibliography.

The following studies, in which the Institute is co-operating, are closely coordinated with the Institute program:

Southern Leaders in Economic Progress by Broadus Mitchell.

A Quarter-Century of Southern Problems by R. D. W. Connor, Josiah Morse, Harry Best, L. M. Bristol, John Wade, Lorraine Bush Tunstall, T. S. Staples, S. C. Mitchell, Iva L. Peters, and others under the editorship of Howard W. Odum.

Electrification of Rural Areas by Addison T. Cutler under the direction of Frank P. Graham, Thorndike Saville, and D. M. Keezer.

Unionism in Southern Cotton Mills by George S. Mitchell.

The Textile Industry in New England and the South by Walter J. Matherly and Claudius T. Murchison.

Social Agencies in Durham County by J. F. Steiner and Margaret Bridgers in cooperation with the Council of Social Agencies in Durham.

Negro Characterization and Folk Beliefs of the Southern Negro by N. N. Puckett.

Rural Vocational Guidance by Cordelia Cox and Clyde Russell under the direction of M. R. Trabue and Howard W. Odum, in cooperation with the Southern Woman's Educational Alliance.

The County as a Social Unit by Edgar T. Thompson.

Poor Relief in North Carolina by Roy M. Brown.

A Genetic Study of Inter-Related Marginal Families by Frank W. Hoffer under the direction of J. F. Steiner.

(See also statements in the several departments of social science).

RESEARCH ORGANIZATIONS

THE ELISHA MITCHELL SCIENTIFIC SOCIETY

The Elisha Mitchell Scientific Society, composed of faculty and advanced students from the Scientific Departments of the University, numbered for the year 1925-26, 184 members (65 active and 119 associate). The officers of the Society were: *President,* H. R. Totten; *Vice-President,* Thorndike Saville; *Permanent Secretary,* J. M. Bell; *Recording Secretary,* E. T. Browne; *Editors of The Journal of The Elisha Mitchell Scientific Society,* W. C. Coker, Collier Cobb, and J. M. Bell. Fifteen papers were presented at the eight meetings held during the year. Of these, thirteen were presented by members of the faculty of the University, one was presented by an advanced student in Chemistry, and one was presented by a member of the Corps of Engineers, U. S. Army.

Programs of the Elisha Mitchell Scientific Society, during 1925-26.

282nd meeting, October 13, 1925.

W. de B. MacNider—The Influence of Pregnancy on the Stability of the Acid-Base Equilibrium of the Blood.

W. C. Coker—Some Remarkable New Fungi from Chapel Hill Soil.

283rd meeting, November 10, 1925.

E. V. Kyser—Application of Hydrogenated Oils to the Production of Transparent Soap.

The purpose of this paper was to present the possibilities of the use of materials which have not been generally utilized in the production of transparent soaps. Formerly it was thought that only tallow, cocoanut oil, and castor oil could be used successfully for this purpose. It was found that by using a hydrogenated vegetable oil having a melting point between 58 and 60 degrees Cent. in the proper proportions in the formulae, transparent soaps of various degrees of transparency could be made from cocoanut, castor, corn, cottonseed, linseed, peach kernel, menhaden fish oil, and rosin. The formulae were worked out so that the per cent. of water, alcohol and sugar was the same as is generally used in soap commonly made from tallow, cocoanut oil and castor oil. It was found that the melting points of the fats and the titer of the fatty acids, when approximately the same for the various combinations, gave soaps of equal value in transparency. This would indicate that the solubility of the soaps has much to do with reaching the point where satisfactory gels can be produced.

E. K. Plyler—The Quantum Theory and its Modern Developments.

The origin of the quantum theory was discussed. The application of this theory to heat, electron phenomena, and radiation and emission of light was briefly given.

Light quanta were explained and different experiments noted that upheld this theory of light. The wave theory of light was shown to be in contradiction to the theory of light quanta. The final outcome of these two theories will depend on the existence of an ether. Einstein's Theory of Relativity tended to show that the ether does not exist. But recently Professor D. C. Miller has repeated the experiments of Michelson and finds that there is an ether drift. If his work is upheld, the wave theory will be sufficient and the light quanta will not take its place.

284th meeting, December 8, 1925.

Major Harold C. Fiske, Corps of Engineers, U. S. Army.

The $500,000 Power-Navigation Survey of the Tennessee River and its Tributaries in Tennessee and North Carolina. (Illust.)

285th meeting, January 12, 1926.

English Bagby—Psychological Effects of Low Oxygen Tension with Relation to Aviators.

(Published in First *Bulletin,* Medical Research Laboratory, Mineola, L. I., N. Y., 1919.)

H. F. Janda—Reinforcement in Concrete Pavements (Illustrated).

(Published under auspices of Highway Research Board, National Research Council, Part II, *Proceedings,* 5th Annual Meeting.)

286th meeting, February 9, 1926.

Otto Stuhlman, Jr.—Developing Ultra-Violet Spectrum of Iron by Electron Bombardment. (Abstract appears on page 67.)

Collier Cobb—The Sand Dunes of Niigata.

287th meeting, March 9, 1926.

J. F. Daugherty—Electrodeless Ring Discharge in Iodine Vapor. (Illustrated.)

The electrodeless discharge is one produced in a bulb without electrodes by electromagnetic induction. An interrupterless X-ray transformer is used to excite an oscillatory circuit. In the oscillatory circuit there is a coil of seven coplanar turns of copper ribbon. This serves as the primary and the bulb some 12 cm. in diameter containing only iodine composes the secondary.

In tubes excited in this way two distinct types of discharge were observed in iodine. The first discharge, produced when the bulb and contents are at room temperature, was a yellowish glow filling the whole bulb. As the temperature is decreased this discharge takes the form of a ring just inside the bulb in the plane of the coil. This type of discharge gives a continuous spectrum with a broad absorption band in the green region. A spectrum of this kind is associated with the gas in a molecular state.

When the temperature of the bulb and its contents is between — 5°C and 5°C the second type of discharge takes place. This second discharge is of the ring type. It is a very brilliant green with a pink border. The pink border extends in toward the center of the bulb, a fact which is easily explained if one assumes that the vapor in this region is in a lesser degree of dissociation than that at the periphery of the bulb. This discharge gives a bright line spectrum.

H. V. WILSON—Studies on Sponge Cells at the Tortugas.

A survey of the Tortugas (Florida) region showed that there were at least nineteen common species of sponges within the 2-fathom limit. These were all silicious or horny sponges, the majority halichondrine. Four species of Pachychalina proved good experimental forms, suitable for research employing the method of growth from somatic cells that are induced to reunite after artificial separation. In all four species, spheroidal masses of reunited cells were easily obtained. In three species, these balls were carried through the stages of attachment and early metamorphosis, and in one species to a stage in which the canal system was well developed. A preliminary experiment on interspecific fusion was made in which a rapid method of testing for this response was employed.

288th meeting, April 20, 1926.

S. C. OGBURN—Analytical Separation of the Platinum Metals. (Abstract appears on pages 8-10.)

E. T. BROWNE—Involutory Collineations Belonging to a Pencil.

289th meeting, May 11, 1926.

R. M. TRIMBLE—Filter Sand Studies.

In investigating fineness and surface moduli as possible criteria for filter sand selection, their relation to each other and to the present constants, effective size and uniformity coefficient was studied. No correlation whatever was found except between the two moduli and that only for a number of size distributions derived from the same original sand by water selection.

W. F. PROUTY—The Triassic of the Durham Basin.

THE PHILOLOGICAL CLUB

Eight meetings were held by the Philological Club in the academic year 1925-26. Seven of these meetings were devoted to papers and one was a special meeting of a social nature in honor of Professor Johannes Hoops, of the University of Heidelberg. Six papers were presented by members of the University faculty, the seventh being delivered by a visiting scholar. The roll of members for the year totalled eighty. The complete program, with abstracts of the papers not appearing elsewhere in this bulletin, is given below.

October 6, 1925. A. T. Johnson, "The Supernatural in the Epic." An abstract of a doctoral dissertation. (See Research in Progress, 1924-25, pp. 44-45.)

November 3, 1925. E. C. Metzenthin, "The Home of the Old Saxon *Heliand*—A New Approach". (Abstract appears on page 54.)

December 1, 1925. U. T. Holmes, "Who Was Marie de France?" (Abstract appears on page 75.)

January 19, 1926. G. A. Harrer, "The Latin Inscription from Antioch."

This is a study, giving criticisms and supplementary suggestions to the first edition of an inscription published in the *Transactions of the American Philological Association*: 55 (1924).

The inscription, discovered in 1924 at Pisidian Antioch, gives the *cursus honorum* of a Roman governor, and, beside it on the same stone, an edict limiting the price of grain. The editor considered that the *cursus* was of one governor and the edict by another; but it is readily to be seen that the governor was one and the same, as this paper shows. The inscription is further shown to be an important bit of evidence to prove that Cappadocia was a consular province during the period of the Flavian dynasty at Rome. (Published in the *American Journal of Archeology,* XXIX (1925), p. 429 ff.

February 9, 1926. John T. Krumpelmann, "German Inspiration in Bayard Taylor's 'Poems of the Orient.' "

This paper is an excerpt from a doctoral dissertation "Bayard Taylor as a Literary Intermediator between Germany and America" (Harvard University, 1924, unpublished). It shows that the American poet has made plentiful use of German sources in the composition of many of the best known poems in this volume. The German poets from whom Taylor has received most of his inspiration are Rückert, Goethe, Heine and Spitta. In many cases the similari-

ties existing between the English poems and their German originals are very close and the work of the American amounts to little more than translation. Not only does direct comparison justify the conclusion that Taylor has borrowed from the Germans but external evidence enables the investigator to establish his case with almost indisputable certainty. From Taylor's diaries and other unpublished memoranda a very close connection can be established between certain of Taylor's compositions and one of Rückert's volumes. The fact that one of Taylor's poems is based on a composition of Spitta is also undeniable. The echoes of Goethe and Heine in the "Poems of the Orient," while also undoubtedly genuine, can be proven to be such only by internal evidence.

March 2, 1926. W. D. MacMillan, 3d. "The Burletta in England, 1750-1843."

A discussion of the nature and prevalence of the burletta on the English stage between the years indicated. Expansion of part of the first chapter of *Planché's Extravaganzas.* (See *Research in Progress,* July 1, 1925, p. 45.)

April 13, 1926. Walter G. Everett, Head of Department of Philosophy, Brown University, "The Philosophy of Tragedy".

The lecturer called his paper an effort to link the insight of philosophy with the human interest of literature. The aesthetic problems: pleasure from contemplation of the terrible, and how the ugly can be beautiful, are solved by the perfection of artistic form so complete as to delight in spite of the repellant theme. The ethical interest centers in some irrationality (defined in terms of value or disvalue; various, though related, types of tragic fault or error) in the conduct of the tragic character which brings on the final catastrophe. The problem of evil in the world is best visualized in tragedy. As tragedy leaves us with the sense of an irrational climax of loss, so in the actual world the destruction of values baffles our understanding. Since tragedy is a real part of experience, to neglect it results in a one-sided and superficial view of life. This does not necessarily involve pessimism; a chastened optimism is still possible, which, to have intellectual standing, must be critical and creative.

May 11, 1926. N. B. Adams, "Some Plays of the Eighteen-Thirties in Madrid.

This paper, suggested by Larra's article *Una Primera Representación* (*Cartas Españolas,* April, 1835) endeavors to give examples of plays popular on the Madrid stage during the period of Romantic fervor. The romantic plays by no means held sole possession of the boards, for in addition one might see: 1. The Comedy of Magic (*La Pata de Cabra* and imitations); 2. The *comedia antigua,* including all plays prior to Comella, original or adapted; 3. Plays after the manner of Moliére and Moratín; 4. The Classic (or Neo-Classic) Tragedy; 5. The plays of Eugène Scribe, whose works had won great popularity

in Spain by 1833; 6. The Sentimental and Terrible Drama (e. g., Kotzebue's *Menschenhasse und Reue*); 7. The Melodrama, mainly a translated importation from the Théâtre de la Porte Saint-Martin; 8. The Historical Play, so often indistinguishable from the Romantic Drama proper. Some of these plays continued to flourish after Romanticism as a definite movement was moribund if not actually dead.

H. D. Learned, "Report on the First Part of the Work on a Critical List of Old French Loanwords in English to 1400."

The report covered the letter A and most of B, in NED. It appears that a considerable number of words referred (NED) to Old French sources are in fact directly from Latin. Necessity of establishing criteria of Latin or Old French origin. Some score of words were noted in senses not recognized by NED, and two or three new words. Three etymologies proposed.

THE GRADUATE CLUB

The first meeting of the Graduate Club, held in October, was addressed by President Chase and Dean Royster. Dr. Chase pointed out the need of a broader interest among graduate students and warned against the danger of narrowing one's outlook in the intensive specialization of graduate studies.

Officers elected were: Louis B. Wright, president; Katharine Jocher, vice-president; and F. C. Anscombe, secretary and treasurer.

A departure from previous custom was made by the executive committee in excluding members of the graduate faculty from meetings except by invitation. This decision was made in order to insure greater freedom of discussion by the students.

Four meetings in addition to the first meeting were held during the year. At the November meeting, talks on foreign study and student travel were made by J. T. Krumpelmann and R. R. Potter. Dr. Krumpelmann described post-war conditions in German universities and related some of his experiences as a student during the previous year in Germany. He paid particular attention to the present attitude of the universities to foreign students, the standards of German universities, and the cost of foreign study. Mr. Potter described his experiences as a research student in London during the previous summer. He pointed out the comparative inexpensiveness of transportation to England by means of student third-class passage.

The January meeting consisted of a round-table discussion of important recent research in the fields of natural science, social science, and languages and literature. Miss Katharine Jocher and F. W. Hoffer led the discussion in social science, S. C. Ogburn, Jr., in natural science, and R. W. Adams in languages and literature.

At the February meeting of the club, Dean Carroll of the School of Commerce spoke on his observations of economic conditions, and Guy Johnson reported on his work in collecting negro folk songs. Dean Carroll described conditions in England, Italy, and Austria. He emphasized the necessity of first-hand study for an adequate understanding of foreign economic conditions. Mr. Johnson explained methods of collecting negro folk songs; he told something of the composition of the songs and gave phonographic reproductions of negro "blue" songs.

At the April meeting, Professor H. M. Jones talked on medieval life and read a number of his verse translations of medieval Latin students' songs. The lyrics read by Mr. Jones consisted of part of a work on medieval Latin lyrics which Mr. Jones is preparing for publication.

SOCIETY OF THE SIGMA XI

The University of North Carolina Chapter of the Society of the Sigma Xi (the Society for the Promotion of Research) was the first and, until recently, the only chapter of the Society in the South. Two general meetings, to which were invited members of the Society resident in other institutions, have been held during the past year. At the annual meeting of the Chapter one alumni, three active, and five associate members were elected, as were also officers for the year 1926-1927. At the commencement meeting of the Chapter the new members so elected were initiated. Following his initiation as alumni member, Dr. G. L. Carrington of Durham, N. C., gave a most interesting account of his investigations in the newest branch of surgery, that of the thorax, with especial reference to surgery of the oesophagus.

The annual Sigma Xi lectures were delivered on April 26th and 27th by Dr. Charles P. Berkey of the Department of Geology of Columbia University, New York City. The first lecture, illustrated with lantern slides, was entitled "Recent Geological Explorations in the Gobi Desert of Mongolia." Dr. Berkey, who was the geologist

of the recent Roy Chapman Andrews Expeditions of the American Museum of Natural History, spoke fascinatingly of the adventures of the expedition, the methods of work, and the results achieved. The second lecture, also illustrated, dealt with "Geological Problems of the Catskill Aqueduct of the New York Water Supply". The romance as well as the difficulties encountered and overcome in the carrying out of this gigantic project were strikingly portrayed.

RESEARCH PUBLICATIONS

Journal of the Elisha Mitchell Scientific Society, Vol. 41

September, 1925—Nos. 1 and 2

Constitution of the North Carolina Academy of Science.

Proceedings of the Twenty-fourth Annual Meeting of the North Carolina Academy of Science.

Proceedings of the Elisha Mitchell Scientific Society, October 14, 1924, to May 14, 1925.

The Life and Habits of the Honey Bee. *H. B. Arbuckle.*

Variation of Protein Content of Corn. *H. B. Arbuckle* and *O. J. Thies, Jr.*

The New World of the Atom and Albert Einstein. *Archibald Henderson.*

Some Undescribed Fungi on Sourwood, Oxydendron Arboreum (L.) DC. *Frederick A. Wolf.*

The Seasonal Catch of Snakes at Raleigh, N. C. *C. S. Brimley.*

Meteorological Inquiries from the Viewpoint of 1795. *Lee A. Denson.*

An Oil-Bearing Shale of North Carolina. *Frank C. Vilbrandt.*

Recent Developments in the Chemical Industries of North Carolina. *Frank C. Vilbrandt.*

Investigation on the Germination and Heating of Cotton Seed in Warehouse Storage. *E. E. Randolph.*

Progress on State Insect Survey with Comparative Data on Other Animal Groups. *Franklin Sherman.*

Iron Coloration in Rocks and Minerals. *Gerald R. MacCarthy.*

Two Rare Types of Abnormality in Cotton Seeds. *S. G. Lehman.*

A New Dioecious Species of Choanephora. *J. N. Couch.*

A Study of the Water Molds and Pythiums Occurring in the Soils of Chapel Hill. *James Vernon Harvey.*

April, 1926—Nos. 3 and 4

Notes on the Spiders of the Southeastern United States with Descriptions of New Species. *Sherman C. Bishop* and *C. R. Crosby.*

Notes on the Genus Aphanomyces, with a Description of a New Semiparasitic Species. *J. N. Couch.*

Plankton Collections in Lake James, North Carolina—Copepods and Cladocera. *R. E. Coker.*

The Modern Electrometer. *Otto Stuhlman, Jr.*

Notes on Woody Plants. *W. W. Ashe.*

Further Notes on Hydnums. *W. C. Coker.*

Tuckahoe on Maize. *Frederick A. Wolf.*

STUDIES IN PHILOLOGY

VOLUME XXII, 3—July, 1925

Thrall, William Flint—The Historical Setting of the Legend of Snedgus and Mac Riagla.

Learned, Henry Dexter—The Old French Retention of Latin "a" in Unaccented Syllables.

Tannenbaum, Samuel A.—Reclaiming One of Shakspere's Signatures.

Howell, Almonte C.—A Note on Sir Thomas Browne's Knowledge of Languages.

Drachmann, A. G.—Alloy and Gold.

Bourdin, H. L. and Williams, S. T.—The Unpublished Manuscripts of Crèvecoeur.

VOLUME XXII, 4—October, 1925

Nicholson, Marjorie H.—The Spirit World of Milton and More.

Kuhl, Ernest—Shakspere's "Lead Apes in Hell" and the Ballad of "The Maid and the Palmer."

Moore, C. A.—John Dunton: Pietist and Impostor.

Graham, Walter—Some Infamous Tory Reviews.

Keith, Arthur L.—The Dawn in Vergil.

Ibershoff, C. H.—Whiston as a Source of Bodmer's "Noah."

Raysor, Thomas M.—Unpublished Fragments on Aesthetics by S. T. Coleridge.

Greenlaw, Edwin—Modern English Romanticism.

Recent Literature.

VOLUME XXIII, 1—January, 1926

Spiller, Robert E.—The English Literary Horizon: 1815-1835 (As seen by the American Traveller).

Paine, Gregory L.—The Indians of the Leather-Stocking Tales.

Reed, Amy Louise—Self-Portraiture in the Works of Nathaniel Hawthorne.

Thompson, Frank T.—Emerson's Indebtedness to Coleridge.

Moore, John B.—The Master of Whitman.

Leisy, E. E.—Materials for Investigations in American Literature. A Report Compiled for the American Literature Group of the Modern Language Association.

VOLUME XXIII, 2—April, 1926

Tannenbaum, Samuel A.—A New Study of Shakspere's Will.

Padelford, F. M., and Matthew O'Connor—Spenser's Use of the St. George Legend.

Oliphant, E. H. C.—The Authorship of "The Revenger's Tragedy."

Peers, E. Allison—Milton in Spain.

Smith, T. V.—Two Observations upon Saurat's "Milton: Man and Thinker."

Taylor, George Coffin—Shakspere and Milton Again.

Craig, Hardin—Recent Literature of the English Renaissance.

THE NORTH CAROLINA LAW REVIEW

ARTICLES

VOLUME III, 4—December, 1925

Statutory Changes in North Carolina Law in 1925.
The Lawyer as a Citizen—His Duty to the Public, *Frank A. Daniels.*

VOLUME IV, 1—February, 1926

Statutory Changes in North Carolina Law in 1925 (continued), *Walter Parker Stacy.*
The Lawyer, His Client, and His Adversary.
Restrictions on a Free Press, *Robert H. Wettach.*

VOLUME IV, 2—April, 1925

Workmen's Compensation in North and South Carolina, *William H. Wicker and Robert A. McPheeters.*

SOCIAL FORCES

VOLUME IV, Number 1, September, 1925

The Larger Cycle of American Development, William Allen White.
The Limit of American Population, Howard B. Woolston.
An Educative Program for World Peace, Jerome Davis.
Monarchs and Rulers: A Comparative Statistical Study, Pitirim Sorokin.
The Concept of Progress: III. The Scientific Phase, L. L. Bernard.
Social Development: II. Social Correlation, Arthur W. Calhoun.

VOLUME IV, Number 2, December, 1925

Masters of Social Science: Lester Frank Ward, James Q. Dealey.
Individual Differences: The Galton-Pearson Approach, Frank H. Hankins.
An Earlier Cycle of American Development, William Allen White.
Social Case Work: A Profession in the Making, I. M. Rubinow.
The South's Challenge to University Men, Marion Rex Trabue.

VOLUME IV, Number 3, March, 1926

Masters of Social Science: Herbert B. Adams, John Martin Vincent.
Measuring the Volume of Social Stimuli, F. Stuart Chapin.
The Social Philosophy of Ellen Glasgow, Edwin Mims.
The Basis of Procedure in Rural Social Work, Jesse Frederick Steiner.
A Social Interpretation: Maryland, Iva L. Peters.
Social Forces and the Evolution of Literature, V. F. Calverton.

VOLUME IV, Number 4, June, 1926

Masters of Social Science: Albion Woodbury Small, Edward Cary Hayes.
Community Concepts, J. M. Gillette.
A Social Interpretation: South Carolina, Josiah Morse.
Geographical Environment and Culture, W. D. Wallis.
The Newspaper and Public Opinion, George A. Lundberg.
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